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THE MILITARY AND SANITARY INSTITUTIONS OF THE ROMAN ARMIES, AND THE CAUSES OF THE DECAY OF THE LEGIONS.

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THE Romans, who were a warlike, wise, and prudent people, never thought it unworthy of their reputation, or their genius, to adopt from all nations whatsoever they found practically good for their purpose, either in military discipline or the operations of war. They were not less open to conviction in all that concerned the health of their soldiers, whether at home or abroad; and pursued the best methods for checking the spread of infectious disease both among men and animals. The study of their military and sanitary institutions, therefore, is inseparably connected with their history and their greatness; and the evidence of such history brings conviction that this greatness ever flowed and ebbed together, in proportion to the perfection of their military discipline. No people were ever more sensible than they how skill and practice, in the art of war, were superior to valour, and could secure for a few victory over armed but undisciplined hosts. By a strict observance of discipline in their camps, by unremitted and constant training to the exercise of arms, by unwearied cultivation of all the

arts of war, and by a strong patriotic sense of their own interest, in the prosperity and preservation of a free government, the Roman soldiers derived confidence and courage from a knowledge of their profession; and were, for nearly nine centuries, invincible against the impetuous but irregular onset of barbarians in battle. Inferior in numbers and stature to the Gauls, Germans, and Spaniards, and yielding to the Greeks superiority in genius and knowledge, yet the Romans, under the Republic and the first Emperors, became masters of the fairest and most productive provinces of the ancient world, and spread the terror of their name among the most remote nations of the earth.

Though the discovery of gunpowder and the introduction of fire-arms have produced a difference between the ancient and modern practice of the art of war, yet the principles of military organisation and of warlike operations have been, and ever will be, the same, notwithstanding modifications and improvements of destructive instruments of warfare. Much of what we now carefully follow, in our system of obtaining recruits rather from the provinces than the towns, of enlisting men at the proper age of manhood, of attending as much to the constitutional vigour of men as to the greatness of their stature, of examining the features, the eyes, and make of the limbs, as indicating the qualities of good recruits, and of rather selecting them from the manly trades of huntsmen, smiths, and carpenters, than from the more effeminate ones of confectioners and weavers, was fully appreciated and attended to in raising and organising the armies of ancient Rome.* But in the latter times of the Roman empire, when, amidst the general corruption of manners, the decay of patriotism, and the avaricious exactions of officers in command, recruits were less carefully chosen than they had been under the Republic and first Emperors, neglect of this first of duties for the good organisation of the Roman armies became, among other causes, a source of their weakness and decay. It may be profitable, but at all events interesting, for us to look more minutely than we are wont to do into the military practices of the Romans, through the light of their own historians, and to learn what modern customs have borrowed from them, or may now claim as improvements of more recent times. A careful and unbiassed examination of this subject might, perhaps, dispose us to make some abatement of our modern claims and pretension of superiority, over those who went before in reducing a knowledge of arms into an art, or in moulding it into precepts for the strategic manœuvres of general engagements, or the manner of conducting sieges.

The Greeks, in these as in other matters, were the preceptors of the Romans. The military science of both peoples embraced two distinct heads, namely, strategy or military command, and a knowledge of tactics, or military evolutions. The one was called the *art imperatory*, and the other the *art of tactics*,† a combined knowledge of these being requisite to form a great and accomplished general. The latter could not, in the long run, secure success in war, unless the general in command, from due foresight and acquaintance with things necessary, made all requisite arrangements for provisioning his army, maintaining the health of his soldiers, enforcing discipline, and preparing, with due care and science, all warlike implements and engines, that might be called for in warlike operations.

* Vegetius de Re Militari, lib. i. c. 2, &c. † Xenophon, Cyropæd. lib. viii. c. 27.

Among the Greek authors who directed attention to these subjects, and whose names are frequently quoted by later Roman writers, were, Iphicrates, Evangelus, Pyrrhus the celebrated King of Epirus, and his Thessalian minister Cineas, who appears to have epitomised the many volumes which Æneas wrote on the theory and art of war. But the original and last only of these works is now extant, and all that we know of the others must be gathered from the later Roman writers, beginning with Polybius, the master and companion of Scipio Africanus; and who, in addition to his excellent history of the wars of the Romans, wrote a system of tactics which has been lost. Professionally and practically he was well acquainted with military operations, and was present with Scipio at the siege and destruction of Carthage B.C. 140. Many passages of the history indicate his extraordinary skill in matters of war. In an extract from the sixth book he has vividly described the constitution of the Roman legions in those patriotic ages of the Commonwealth when, as Gibbon observes, and like ourselves at this moment, the use of arms was reserved for citizens who had a country to love, property to defend, and a duty to maintain. In latter times of the Emperors Trajan, Hadrian, the Antonines, and Valentinian the Second, we possess the more elaborate treatises on tactics of Ælian, Julius Frontinus, and Flavius Vegetius, the last of whom is the most complete expositor of all the Roman military institutions. He was the co-temporary, as it appears, of the Emperor Valentinian II. A.D. 375-392, and not only wrote the military institutions of the Romans, but a work on the distempers of horses and cattle, and the best methods of preserving their health, and preventing the spread of infectious diseases.

An acquaintance with military history, and the classical records of the origin and art of war in former ages, has ever been deemed a part of necessary acquirement for an accomplished military leader, and what had in this respect been learned so well by Cæsar gives life and vigour to the vivid narratives of his own campaigns. Modern military customs, in every department of the service, have been borrowed from the Greeks and Romans. Surely then a classical and historical knowledge of what they knew on the subject of organising armies, of training and exercising soldiers, of supplying and provisioning troops, of preserving their health, of disposing them in order of battle, of entrenching their position before superior forces, and of attacking and defending fortified places, will be no mean foundation for special training in the more enlarged and improved system of modern warfare. On all of these heads Vegetius is capable of supplying useful information, and he drew his inspiration, as he tells us, from the commentaries of Cato, Celsus, Trajan, Hadrian, and Frontinus on the Art of War.

In this lecture I propose to bring briefly before you—

1st. The constitution of the Roman armies and military establishments, under the Commonwealth and the Emperors, their discipline, training, and equipment.

2nd. The mode of conducting and provisioning their army, and the means of preserving its health.

3rd. Their system of selecting defensive military positions fortified by nature and art.

4th. The causes of the decay of the legions.

1st. The Roman armies consisted of the infantry and cavalry of the legions, of an establishment of engineers and miners, accompanied by all the machines necessary for besieging and defending fortified positions, and of the auxiliary or mercenary troops made up of different nationalities, that were bound together by no common tie, either of unity of discipline, acquaintanceship, or natural disposition.* "But Roman bravery," says Vegetius, "was in the main powerful according to the discipline of the legions;" an observation not to be lightly passed over or lost sight of by ourselves, who, in organising means of national defence, by our militia and rifle corps, have adopted a system at once the most economical and best suited to the self-reliance and habits of the English people. In the best times of the Commonwealth the Roman citizen was individualised into the Roman soldier, and it was by a like system of national military development, and by perfecting practice in the exercise of our national weapon the bow, that our countrymen won the battles of Poictiers and Agincourt.

The auxiliaries were in many respects similar to our own subsidiary troops in India; but the number of legionary soldiers in the army was generally more considerable than that of the auxiliaries. The recruiting and enrolment of the soldiers of the legions, on the authority both of Polybius and Vegetius, were carried out with the greatest care and attention under the Commonwealth,† due regard being paid to the essential merit of descent, age, strength, and military stature, things that were less attended to in the latter days of the Empire. The last author lays much stress on the necessity of attending to these things in the following words: "Juventus enim, cui defensio provinciarum, cui bellorum committenda fortuna est, et genere si copia suppetat, et moribus debet excellere: honestas enim idoneum militem reddit. Verecundia, dum prohibet fugere, facit esse victorem. Quid enim prodest si exerceatur ignavus—si pluribus stipendiis moretur in castris? Nunquam exercitus profecit tempore belli cujus in probandis tyronibus claudicarit electio,"‡—"For the youth, to whom is committed the defence of the provinces and the fortune of war, ought, if the supply may admit, to be distinguished by birth and for conduct: for a sense of honour makes the fit soldier. Self-respect, while it prevents flight, makes him victorious. For what does it profit if the dastard be drilled—if through several campaigns he should be lingering in the camps? That army never was serviceable in time of war whose organisation was defective in making choice of recruits."

Before being admitted into the service, or distinguished by the military mark, the recruits were examined in respect of their physical and mental capacity for duty, and then put on trial as to whether they possessed the requisite degree of military self-reliance;§ they had then an oath administered to them with imposing solemnity, that they would be obedient to their commanders and execute their orders to the utmost of their power.‖ Having passed through these preliminaries of admission, they were taught

* Vegetius de Re Militari, lib. ii. c. 2.
† Polybius, lib. vi. c. 1; and Vegetius de Re Militari, lib. i. c. 1 to 8.
‡ Vegetius de Re Militari, lib. i. c. 7.
§ Vegetius de Re Militari, lib. i. c. 8. ‖ Polybius, lib. i. c. 63.

the military step, exercised to run, to leap, to swim, to carry heavy burdens, to cut and thrust with the sword, to acquire the familiar use of all arms, offensive and defensive, and to perform a variety of evolutions necessary for their movements in battle. The recruits were thus carefully chosen, and, having been daily exercised for the space of at least four months, were then thought sufficiently prepared for being embodied in the legions.

In the time of the Commonwealth, when their military instructions were drawn from the most perfect model of Roman discipline, the number allotted to each legion was four thousand two hundred, and sometimes five thousand, when any great or unusual danger appeared. "Never more than two legions, besides auxiliaries," says Vegetius, "were at this period sent under one consul, against the most numerous forces of their enemies, such being their perfect discipline and self-reliance that they were found equal to all the exigencies of war." In later times, however, under the Emperors, the imperial legions, as described by Gibbon on the authority of Vegetius, were divided into ten cohorts and fifty-nine companies, under the orders of a corresponding number of tribunes and centurions. They consisted in the whole of six thousand one hundred heavy-armed foot soldiers, associated with a body of cavalry amounting to seven hundred and twenty-six horsemen (figs. 1, 6, 7), who with the light-armed foot, consisting of the *ferentarii*, archers (fig. 4), slingers (fig. 3), and *balistarii*, composed the wings

FIG. 1. — Legionary Soldier; from the column of Trajan.

FIG. 2.—One of the Hastati; from the column of Antoninus.

FIG. 3.—Slinger; from Trajan's column.

of the army. The first cohort, which exceeded the others in the number and quality of the soldiers, selected from men of family and education, was appointed to guard the golden eagle and the images of the emperors (fig. 5).

The legionary troops were either heavy or light armed. The former, drawn from men in their full strength and vigour, consisted of the *hastati* (fig. 2), the *principes*, and *triarii*, while those younger and of inferior condition were set apart for light-armed troops. From the foundation of the city to the time of the Emperor Gratian, A.D. 375, the arms of the foot soldier were, a helmet, a cuirass or breastplate, greaves on the legs, and a buckler on the left arm. Their missive weapons were a double-edged Spanish sword, suited to either give point or to strike; sharp, iron-headed javelins a foot in length, carried in the buckler and used as darts; and

the heavy javelin, six feet long, which was launched with great effect against cavalry at the distance of ten or twelve paces.

FIG. 4.—German Archer; from the column of Antoninus.

FIG. 5.—Standard-bearer; from Trajan's column.

The armies of Rome were commanded by officers of liberal birth and education, among whom the præfect, on whom devolved the chief command, in the absence of the emperor's lieutenant, was considered the special officer of the legion. The tribunes, centurions, and the soldiers in general, were under his orders, and on him devolved the duty of maintaining strict discipline and obedience, and of exercising daily the

FIG. 6.—Legionary Trooper; from the column of Antoninus.

FIG. 7.—Mounted Archer; from the column of Antoninus.

legionary horse and foot. Inferior in rank to this officer there were also præfects of the camp, and of the engineering train of miners, workmen, and mechanics. The authority of the former extended over the sick and the physicians in charge of them; and to him was assigned the duties of selecting the site of the camp, of superintending the entrenchments for its defence, of having charge of the baggage, and of inspecting the tents and huts of the soldiers. He had also the camp carriages and horses at his disposal, and all the war engines were under his direction. The præfect of the engineering train and workmen had the duty of constructing barracks in the winter camps, and of making and repairing the various

kinds of engines and machines necessary for the attack and defence of places.

2nd. The Romans were fully alive to and sensible of the truth of the adage, "Sæpius enim pænuria quam pugna consumit exercitum, et ferro sævior fames est,"* "For want often wastes an army more than battle, and famine is more terrible than the sword." In recognising the force of this, they made it a point of supreme importance and necessity, when entering on a campaign, to secure plenty of supplies for their armies. Provisions of all kinds, forage, and corn, estimated in quantities according to the number of troops, horse and foot, were ordered to be provided by the provinces, and stored up in the strongest and most convenient cities. By careful management of the magazines, and a frugal distribution of the provisions to each man without distinction of rank, sufficient supplies for the army were generally secured. The soldiers were thus provided with wood in winter, water in summer, and with corn, wine, and vinegar at all times. The Roman commanders knew full well the value of foresight in these matters, without which the discipline and valour of their finest armies were as nought, while their numbers melted away like water in the desert.

Nor were they less careful to provide against the contingencies of disease among their troops, and to adopt means for preserving the health of their soldiers. They paid the greatest attention, therefore, to the choice of a healthy situation for their encampments, remote from unwholesome marshes, and provided with good water; not to expose the soldiers without tents to the heats of summer, or on dry, arid plains without shade or shelter; to supply them in winter with fire-wood and warm clothing, and never to expose them during night to either frost or snow; and to begin their march by break of day during the extreme heats of summer. They considered hard, marshy water a kind of poison, and the cause of epidemic diseases. It was imposed as a special duty, therefore, on whoever was in chief command of the troops, and also on the tribunes, that the soldiers should be duly practised in the military exercises, such being more effectual than medicine in preserving their health; while those who were sick were supplied with suitable diet and diligently attended by the physicians. Frequent changes of encampment were made, during summer and autumn, in order to obtain good water and prevent the corruption of the air: in short all the sanitary provisions of military hygiene, which through the public press and the authorities have been enjoined in this country on all concerned, as if parts of a new science discovered but yesterday, were fully appreciated by and acted on by the Roman commanders.

It was thought indispensable that the commander-in-chief, on whose foresight and bravery depended the fortunes of his country and the glory of the state, should not only have perfected himself in the science of tactics and the art of war, but be well instructed in the means of husbanding his resources and preserving the health of his men. He was expected to study the strength, spirit, and composition of his army, whether made up of raw recruits or veteran soldiers, and to perfect discipline and order by strictly enforcing obedience to his commands, under all the contingencies of place and circumstances.

* Vegetius de Re Militari, lib. iii. c. 3.

In the 3rd place the Roman generals were sensible that not only was the success of a campaign mainly dependent on those things, but that to secure victory they should endeavour to obtain the advantage of high ground and superior situation before disposing their troops in order of battle. They could fully estimate the advantage of occupying any elevated position, rendered more formidable, to a numerous enemy in front, when strengthened against their attacks by either a wood or a morass. They could thus drive back their antagonists with greater impetuosity, throw their darts and javelins with more effect, and force back their struggling assailants with almost certainty of defeat. When drawing up their troops also, in order of battle, they placed the more experienced and veteran soldiers, called *principes*, in the first line; posting in their rear a second line of select infantry soldiers, called *hastati*, armed with cuirasses, javelins, and pikes. These two lines of soldiers, who were experienced and heavy-armed, were never to break their order, even to join in pursuit; but were to remain immovable as a wall, and receive the enemy's charge with steadiness and stability. Behind these were drawn up two other lines of light armed foot, the *ferentarii* and *martrobarbuli*. The former consisted of light active soldiers and young archers, expert in the use of the javelin; the latter were composed of the youngest archers, skilled in the use of the small javelin and armed with light shields. These two bodies, like our light infantry soldiers, were to begin battle by advancing to annoy the enemy with their darts and arrows. If they put them to flight they pursued them in conjunction with the cavalry; but if repulsed they fell back on the two first lines, retiring through the intervals to the rear; while the two foremost lines sustained the whole weight of the enemy's attack. The cavalry were always drawn up on the wings of the infantry.

It was also part of the Roman system of war, in erecting fortified cities or castles for their magazines, to select for their site high and steep places surrounded by the sea, or made more difficult of access by a marsh or a river, and these were artificially made stronger by means of walls, ramparts, and ditches. For the construction of ramparts parallel walls were built at short distance from each other, and filled up with the earth taken from the ditches. The inner wall was considerably lower than the outer, so that the space when filled up should present a graduated slope from the city to the top of the rampart. The ditch also was made broad and deep, and so flooded with water that the depth of it might effectually prevent the mining operations of the besiegers from without. The gates of the fortification were strengthened by the woodwork being covered with leather and plates of iron; and in some cases there was an additional work thrown up before the gate, with a portcullis suspended at the entrance by means of iron rings and ropes, and capable of being let down on the approach of an enemy. The magazines of these fortified places were well stored with coals, wood, and military arms of all kinds, and quantities of bitumen, sulphur, and liquid pitch were kept ready for burning the machines of the besiegers. A vivid and heartrending description of the use and destructive effects of these things, both by the Jews and the Romans, is presented to us in the various accounts we possess of the siege and destruction of Jerusalem by Titus.

I come now in the 4th place to trace the causes by which the armies

of Rome, long invincible, and which had been the terror of her enemies, so fell away from their pristine perfection and discipline as to lose the respect of their barbarian enemies, from the middle of the fourth to the end of the fifth centuries of the Christian era.

The military constitution of the ancient legions, as I have described them, prescribed that the soldiers should be recruited from the best and bravest of the Roman citizens, who were animated, in the performance of duty, by a truly patriotic love for the protection and glory of their country; while they saw that public places of rank and emolument were open to their ambition, and obtainable as the rewards of their own merit, exertions, and long services. So long as such were the prizes to be contended for, the Roman soldiers cheerfully gave themselves up to all the labour and rigidity of strict military discipline, and all the danger and hardships of foreign service. But soon after the age of the Antonines, when, through a long peace, the general felicity and luxury of Roman citizens, the love of refinement, and the corruption of manners, the manliness and greatness which had been fostered under great and popular governments now gave way to effeminacy and degeneracy, the Barbarian countries of Europe that had been subdued supplied the legions with excellent but not patriotic soldiers; the legions were less carefully recruited than they had been, and filled with mercenaries; the employment by the Emperors of prætorian guards for the protection of their persons; the lost sense of national honour, once nourished by creditable ambition, and the want of public courage, all contributed to weaken the discipline and obedience of the Roman armies: till, as Vegetius says, the name of Legion remained, but its strength and substance were gone; the only fountain of honour or of justice was the capricious will of the sovereign, who trusted for defence to a mercenary army; which demanded from him concessions in proportion as the need of his government increased.

The Roman soldiers thus yielded to the natural indolence and indulgence incident to human nature; threw aside their obedience and allegiance; and gave way to the effeminacy of the times. They complained that their duties were too severe, their arms too heavy, the rewards too distant, and the discipline beyond their strength. They were consequently permitted to lay aside their armour, to make use of lighter weapons of defence, and to relax their accustomed military exercises, which had rendered them superior to their enemies. The consequences of all these things were, that when they were brought into battle against the hardy Goths and Huns of the North of Europe, who were expert and practised in the use of the long bow, the Roman armies fled before them in dismay.

In the experience of these things among the Romans, we may derive a not unprofitable lesson for ourselves, "that constant and well-appointed preparation for war is necessary to preserve peace."

Friday, January 27th, 1860.

CAPTAIN E. G. FISHBOURNE, R.N. C.B., in the Chair.

THE HISTORY OF THE HORSE, AND HIS COMPARATIVE VALUE FOR MILITARY AND OTHER PURPOSES.

By JOHN CRAUFURD, Esq., F.R.S., &c.

The horse—the noblest conquest of man over the lower animals, although not the most difficult, for in this respect it must yield to the elephant, as in utility it must to the ox—is at present nowhere found in its original wild state, although the ass and the ox unquestionably are so. A true wild horse was supposed to exist in the mountains of Thibet; but a specimen of this animal has at length been brought to England, and is now to be seen in the gardens of the Zoological Society. It is, however, of the family of the asses, somewhat taller than the true wild ass, lighter in the shoulder, longer in the neck, with shorter ears and a more horse-like head. It is, in fact, I am assured by an eminent naturalist, my friend Dr. Falconer, the Djiggatai of the Moguls, and hunted by them for its flesh—considered by Tartars to be better venison than that of any deer.

In the domesticated state, the horse has immemorially existed in every region of the Old World, the Arctic excepted. His disappearance from the absolutely wild state is probably to be accounted for from his natural *habitat* being the open plain; from the facility with which he would hence be captured, and, when captured, tamed, domesticated, and made useful.

As we now see him, the horse consists of an almost infinite variety, differing in size, in form, in colour, and even in disposition. Much of this variety has, no doubt, been the work of man, but it is so great that it is difficult to believe, when we consider the insuperable difficulties to intercommunication which existed in early times—always rude times—that all the widely differing races could possibly have sprung from a single species, or that time, soil, and climate could have produced so prodigious a diversity. To account for it, then, I think we must come to the conclusion—and I am not the first that has come to it—that there must have existed originally a great number of closely-allied species capable of commixture, and of producing a fertile offspring. Such is certainly the case with the ox and the dog, and probably even with the human race itself.

For this inference a good deal of evidence might be produced. Thus, language countenances the theory. In every original tongue of countries in which the horse appears to have been indigenous, so far as

I have been able to discover, it has a peculiar and distinct name. Thus, it has a distinct name in Greek, in Latin, in German, in the Celtic tongues, in Persian, in Arabic, in Sanscrit, in the languages of the South of India, in the Hindu-Chinese tongues, and in the languages of the Malayan Islands. Sometimes it has two names, a native with a foreign synonym, as in Irish or Gaelic and in Javanese—in the first case the synonym being Latin, and in the last Sanscrit. In countries in which the horse had unquestionably no existence, it naturally takes its name from the language of the people who introduced it. In South and Central America, and the Philippine Islands, the name is Spanish, taken from the Latin; and in North America and Australia it is English.

There are two broad distinctions in the horse—the full-sized one and the pony—which seem to point, at least, at two distinct aboriginal races or osulating species. No change of climate or skill in breeding, supposing there be no crossing, will convert the one into the other. In most countries both exist together; but in some, one of them only exists. Thus, in the inter-tropical countries which lie between India and China, and in the islands of the Indian Archipelago, the pony only exists, and the full-sized horse is as unknown as the ass or the camel. In the languages of these countries, consequently, there is but one name for the horse, while in the languages of Hindustan and Persia there are distinct terms for the horse and the pony. In Arabia the horses are all comparatively small and do not materially differ in size; so there are no ponies, and, consequently, in the copious Arabic language, no distinct terms for horse and pony. It may be suspected that the same was the case in some of the poorer and remoter parts of the British islands, for in the Celtic languages the pony has no other name than "little horse."

Soil and climate, independent of the care of man in feeding and breeding, of which, in the ruder states of society, the horse receives little or none, seem to have very little influence on its size, form, or disposition. In the temperate western parts of Europe it is found of a size never seen in any part of Asia or Africa: it thrives even in countries in which nature had not originally planted it, and this applies to every region of America, from the equator to Terra del Fuego. Over this wide region, with some allowance for patent neglect, it is still the Spanish horse introduced about three centuries ago. In the absence of powerful carnivorous animals, and with abundant pasture, it there multiplies much faster than it could at any time have done in any part of the Old World,—so fast indeed as, in many cases, to have regained its liberty and to have returned to its wild state, yet ever retaining that variety in colour which marks its once subjection to man.

Like America, the Philippine islands were found without the horse. The Spaniards introduced it, but in this case they introduced the Spanish horse from South America, and along with it the pony of the neighbouring Malay archipelago, and the result is, that the breed of horses of these islands is a kind of galloway, intermediate between the two races. Here, too, under conditions as favourable as in America, it has run wild.

The Southern hemisphere opposes no obstacle to the successful multiplication of the horse, since we find the different breeds of the

English horse thriving nearly as well in Australia, New Zealand, and the southern extremity of Africa as in the country from which they came. In countries to which the pony only is indigenous, the full-sized horse thrives perfectly, as is seen from its introduction, in very recent times, into Java and the country of the Burmese.

The notion that all the different races of the horse have proceeded from one original stock has no warranty from history. As long as the horse receives no special care in breeding, he undergoes no change, and such care he only receives in a considerably advanced state of society, or where, as in the case of the Arabs, he is an object of special and peculiar importance. The half-wild and neglected horse of South America, does not materially differ from his progenitors introduced by the Spaniards above three hundred years ago, and our own Shetland and Welsh ponies most probably differ in no respect from their predecessors of the time of the invasion of Julius Cæsar. The squab, strong, and enduring Tartar horse of the present day is, in all likelihood, the same kind of animal, by help of which Attila, and Gengis, and Timur effected their conquests,—the same with which the Tartar tribes subdued China twice over, and against whose incursions a wall of 1,500 miles long was no security. It is the same, too, which the allied armies will encounter in their march on Pekin—a shaggy rough galloway, under fourteen hands.

Through the care of man, it is needless to add, vast improvements have been effected in the horse. This care, as is well known, has been long bestowed by the Arabs. It is certain, however, that in Arabia, as in every other country, a native race must have existed to afford the materials for selection. In the sacred writings Solomon is represented as purchasing his stud, not in Arabia, but in Egypt, from which it has been very hastily inferred that the last of these countries, and not the first, is the parent country of the high-bred Arab as we know him. For this notion, however, I can see no good foundation. The Egyptians of the time of Solomon were a civilised and wealthy people, with abundance of horses, and the Israelite king naturally went for his to the best or most abundant market, which was Egypt. The Arabs of the same period were a rude, nomadic, and isolated people, and so they continued for a long time after, until, indeed, Mahomed, in the seventh century of our own time, "breathed," as Gibbon expresses it, "the soul of enthusiasm into their savage bodies," and made them a united, a conquering, and in many respects a prosperous people. It was most probably then only that they began to pay special attention to the breeding of the horse, the result of which has been the production of that animal which, in so far as form, bottom, and beauty are concerned, is considered the perfection of the blood horse. He is, however, in size what we should call a mere galloway, and when in perfection seldom exceeds fourteen and a half hands high. He cannot be said to be master of a weight exceeding ten stone, and yet there is some adaptation of his strength to the usual class of riders he has to carry, for the man of Asia is much lighter than the man of Europe. In India it has been ascertained that on an average the Indian trooper is lighter than the English light dragoon by no less than two stone and a quarter. The difference between the Englishman

and the Arab is probably not so great, but still it must be very considerable.

The Arab horse has been justly praised for its gentleness and docility, qualities generally ascribed to its rearing and tuition. I am, however, satisfied that this character is far more owing to the natural temperament of the race, for it sometimes happens that an Arab is vicious, and, when he is, he is exquisitely and incorrigibly so. There is one quality in which the Arab horse perhaps excels every other, endurance of continuous labour. A little Arab of 14 hands, for a bet of £500, ran 400 miles in five consecutive days, or at the rate of eighty miles a day, carrying 10st. 7lb. This feat was performed on the race-course of Bangalore, but thirteen degrees distant from the equator. The horse was Jumping Jemmy, and the rider, as meritorious as his horse, Captain Horne, of the Madras Artillery.

I will give you, however, the description of a genuine Arab, more lively as well as more amusing than any other that I am acquainted with. It is that of Evelyn, in excellent quaint English. In the year 1683, the Turks, under their Grand Vizier, invested Vienna, and the Emperor of Germany and his ministers fled. John Sobieski, elective King of Poland, came to the rescue. The Turkish army was entrenched, and the Grand Vizier, in Turkish fashion, was taking the matter coolly and quietly, for he was seen from a neighbouring height smoking his chibouk and sipping his coffee. Polish blood could not stand such a sight, and the Polish cavalry, lance in hand, cleared the entrenchments, entered the Turkish camp, routed the army, and pursued it to Hungary and beyond it. For this service, in less than a century, the Poles were requited, after a peculiar fashion, by having their country partitioned, and a large slice of it taken by the descendants of those who but for them might have been now crying "Bismillah" instead of being in league with the Pope. Some Arab horses were among the spoil, and were brought for sale to England, and exhibited before Charles II. The following is the account given of them in the Diary. "Dec. 17th, 1686. Early in the morning I went into St. James's Park to see three Turkish or Asian horses, newly brought over and first shown to His Majesty. There were four, but one of them died at sea, being three weeks coming from Hamburgh. They were taken from a Bashaw at the siege of Vienna, at the late famous raising of that leaguer. I never beheld so delicate a creature as one of them was, of somewhat a bright bay, two white feet, in all regards beautiful, a blaze: such a head, eyes, ears, neck, breast, belly, haunches, legs, pasterns, and feet,—in all regards beautiful and proportioned to admiration, spirited, proud, nimble, making halt, turning with that swiftness and in so small a compass as was admirable. With all this, so gentle and tractable as called to mind what Busbequius speaks of them, to the reproach of our grooms in Europe, who bring up their horses so churlishly as makes most of them retain their bad habits. They trotted like does, as if they did not feel the ground. Five hundred guineas were demanded for the first, three hundred for the second, and two hundred for the third, which was brown. All of them were choicely shaped, but the two last not altogether so perfect as the first. It was judged by the spectators, among whom was the King, the Prince of Denmark, the Duke

of York, and several of the Court, noble persons skilled in horses, especially M. Faubert and his son, Provost Masters of the Academy, and esteemed of the best in Europe, that there were never seen any horses in these parts to be compared with them."

The present races of the English horse are, with the exception of the ponies, a very mixed breed. Our draught horses are in a large degree derived from the horses of Flanders, and it is by no means improbable that our Saxon forefathers brought with them some of the heavy horses of Holstein and Sleswick. An indigenous full-sized horse, however, certainly existed in the time of the Roman dominion. It was this, most probably, that was used in the scythed chariots of the Britons. It was, at all events, possessed of such good qualities as to be much sought after on the Continent. From this horse and the blood of the Arab has sprung our famous race-horse, far exceeding in fleetness all others. The Arab, for breeding, seems first to have been introduced in the beginning of the seventeenth century, in the reign of James the First. In about a century's time, or ending with the time of Queen Anne, all the benefit derivable from the Arab blood seems to have been completed. It is certain, however, that the original unmixed English horse, from which the race-horse derives its size and strength, must have possessed excellent qualities, for we have in proof the fact that Flying Childers, supposed to be the fleetest horse that England ever produced, was the immediate offspring of an English mare by the Darley Arabian, a genuine Arab of the Desert, —that he was, in other words, a half-bred, a fact which seems to be implied by his portraits, for, although his other points appear unobjectionable, he has a large coarse head, such as a true Arab never had. The celebrated Eclipse traced his pedigree not very remotely to the Godolphin Arabian, which has been supposed by some to have been a Barb, but I fancy only from the fulness of his crest. If the account I have heard be true, that he was a present from the Sultan to Louis the Fourteenth, the probability is that he was a true Arab, as the Sultan could easily have got one without going to the mixed blood of Barbary.

Although, however, no account is given of the dam of Flying Childers, it is likely that she may have had some Arab blood, for the horse was of the time of Queen Anne, before which Spanish, Barb, and even Arab, horses had for 100 years been introducing into England.

If, then, the Arab blood be the only true one, there is no such thing as a thorough-bred English horse. Our race-horse, with all its perfection, is, in fact, a factitious breed. That it is mostly derived from the Arab, however, will probably be inferred from its corresponding with it very perfectly in colour. With the Arab, the prevailing colours in the order of their frequency are, grey, bay, and chestnut. It is never sorrel, roan, or piebald, and very rarely black, and such also is the case with the English blood-horse.

The superior speed of the English racer over the Arab has been frequently determined, as might well be expected from an animal on an average by two hands higher, with every racing point at least equal. In 1814 a second-rate English horse, Sir Solomon, ran a race of two miles on the course of Madras against an Arab, which, giving heavy weights, had beaten every other Arab in India. This was the Cole

Arabian, afterwards brought to England. He was under fourteen hands high, and received a stone weight. The English horse, an ill-tempered one, ran sulkily during the first part of the race, and there was every appearance that he would be distanced, but in time he ran kindly, overtook the Arab, and beat him handsomely. His success was followed by the acclamations of thousands of Natives who were assembled on the course. This statement I had from an eye-witness. In 1828, the English horse Recruit beat easily the Arab Pyramus, the best at the time in India, giving him two stone nine pounds. The distance, run on the race-course of Calcutta, was two miles.

A few years ago a match was run between an English blood-mare and the best Arab in Egypt. The race was ten miles long over the Desert. For the first mile the horses went neck and neck, after which the mare ran a-head, and before the race was over, the Arab was left behind and out of sight. In fact, the difference in speed between the English racer and the Arab is something like that between the hare and the antelope.

The European cavalry horse of the Middle Ages was of necessity a powerful animal, since he had not only to carry a rider covered with armour, but had armour of his own to bear. The same kind of horse seems to have been continued even down to the Revolution, as we see it represented in the equestrian statues of Charles the First and William the Third. Sir Walter Scott, in his "Crusaders," gives a very graphical account of the war-horse of the Middle Ages, as contrasted with the Arab, in his imaginary duel between Cœur de Lion and Saladin in the Desert. Sir Walter, by the way, was himself a cavalry officer, having attained the rank of full major in the East Lothian Yeomanry. Gibbon, I may here add, was also a military man after a way—a major of militia—to judge by the accounts we have of his person, probably not a very active one on parade, and he was never tried anywhere else. He informs us himself, however, that his training as a militiaman contributed largely towards enabling him to write "The Decline and Fall of the Roman Empire."

With such horses as I have now described, the style of horsemanship, and the kind of exercises in vogue towards the end of the seventeenth century, may be judged by a passage from the "Diary of Evelyn," dated the 13th of December, 1685. "I went," says he, "with Lord Cornwallis to see the young gallants do their exercise, M. Faubert having newly railed in a *manège*, and fitted it for the academy. There were the Dukes of Norfolk and Northumberland, Lord Newburgh, and a nephew of Duras, Earl of Feversham. The exercises were,—1st. Running at the ring. 2nd. Flinging a javeline at a Moor's head. 3rd. Discharging a pistol at a mark. Lastly. Taking up a gauntlet with the point of a sword;—all these performed in full speed. The Duke of Northumberland hardly missed of succeeding in every one,—a dozen times, as I think. The Duke of Norfolk did exceeding bravely. Lord Newburgh and Duras seemed nothing so dexterous. There I saw the difference of what the French call *belle homme à cheval* and *bon homme à cheval*, the Duke of Norfolk being the first, that is, a fine person on a horse, the Duke of Northumberland being both in perfection, namely, a graceful person and

excellent rider. But the Duke of Norfolk told me he had not been at this exercise for these twelve years before. There were in the field the Prince of Denmark and the Lord Lansdowne, son of the Earl of Bath, who had been made a Count of the Empire last summer for his service before Vienna."

The Arabs occupied Spain for seven centuries, and the African shore of the Mediterranean they have possessed for twelve, and from the intermixture of the blood of their horses with that of the native races has been derived the jennet and the barb. A good native horse, however, probably existed in both countries, and indeed with respect to Barbary it may be considered certain, when we know that the Numidian horse formed the best cavalry of Hannibal, and contributed largely to his victories over the Romans. The Persian horse is said to have some Arab blood, but it cannot be large, for the modern horse does not materially differ from that represented with great spirit and seeming truth in a celebrated mosaic pavement of Pompeii, which is, at least, by seven centuries older than the conquest of Persia by the Arabians. The horses of the mosaic are, in fact, very ordinary animals, without the smallest show of blood, and so is the modern Persian horse.

But, besides those already named, there are horses in various parts of Asia which seem to be endemic in the countries in which they are found, and to have received no admixture of foreign blood. Such a race is the squab, strong, and sure-footed little horse of Butan, called the Tangan, frequently imported into Bengal. The small horse of Thibet is another instance. Like the shawl-goat, and all the other animals of the elevated and dry region which it inhabits, it has a double coat of hair, a long shaggy outer one, and at the roots of this a fine woolly one corresponding with that which in the goat is the material of the Cashmere shawl.

The horses of the plain of Hindustan are of ample height and considerable activity, but wanting in strength, and above all in bottom, and very often vicious. It is remarkable that the best breeds are found towards the south, and especially in Central India, and the worst towards the East, including Bengal and Orissa. As no remarkable care in breeding is anywhere bestowed by the Indians, the superiority of the horses of such countries as Mysore, Cattewar, Gujrat, and Malwa, may be attributable to a peculiar suitableness of soil and climate, and probably to the introduction, in remote times, of some portion of Arabian blood. In general, the Indian horse is what the Irish, and sometimes the Scots, call a *garron*, that is, a vulgar hack. At all events his inferiority is declared by the necessity we are ourselves under of going to the Persian and Arabian gulfs, to the Cape, and to Australia, for a better. One flagrant misnomer which Europeans apply to the common Indian horse may be noticed. He is usually known to them under the appellation of *tazi*, meaning jade, and almost "screw," whereas the word, which is Arabic, properly signifies a true Arab.

Proceeding south, we have the Burmese or Pegu pony, and among the Islands of the Indian Archipelago, from Sumatra to Timur, a great variety of races, for every island possessing the horse has, at least, one race, and the larger several. Among these the most remarkable is the horse of a certain volcanic island called Sumbawa, and more especially

of a district of it called Gunung Api, which literally signifies "fire mountain," or, in other words, "the volcano." The Sumbawa horse is generally below twelve hands, and its most frequent colours grey and bay, occasionally sorrel, but, as with the Arab, rarely black, and never piebald. It has the legs and the blood-head of the Arab, its spirit, bottom, good temper, and, proportioned to size, more than its strength. Of these I remember that the late Sir Stamford Raffles presented a set of four to the Princess Charlotte, which she drove in Windsor Park. With relays of these insular ponies, I have myself, as did many others of my contemporaries, ridden 100 miles on end, at the average rate of ten miles an hour. The weight carried was full thirteen stone.

The most current name for the horse of the Indian Archipelago is the corruption of a Sanscrit one, and from this circumstance it might at first sight be supposed that the animal was introduced from India. For this, however, there is no foundation, for the Indian name is but a synonym, for, in the language of Java, where the horse is most numerous and which is the chief seat of Hinduism, the current name is a native one. In one of the principal languages of the great island of Celebes, the horse bears the Javanese name, while in another it is known by the odd one of the "buffalo of Java." In Celebes, which contains extensive grassy plains, and no tigers, the horse is found in the wild state, and he is hunted with the lasso and reclaimed as in America. From these facts, we may be disposed to infer that the Javanese, long a civilized people, taught the people of Celebes—a very rude one, even when first they became known to Europeans—the art of domesticating the horse. It may be added, in corroboration of this view, that the horse of Celebes differs materially from that of Java, being larger, stronger, and better bred.

Proceeding eastward and southward, the horse is found, for the last time, in Timur and Sandalwood Island, each of which has a race peculiar to itself. In no island of the North or South Pacific Ocean was the horse found. Going northward, after quitting Borneo and Celebes, we find a native horse, for the first time, in the Japanese Archipelago. This would seem to be a peculiar race, if the horse of Japan was not imported from the rude countries on the Gulf of Okotsk, which, considering the state of the Japanese navigation, is not very probable. Here we have no longer the mere ponies of the Indian Archipelago, but the full-sized horse, which old John Adams, a mariner, born and bred in Wapping, and a mighty favourite of the Emperor of Japan of his day, writing from the spot in 1613, thus describes:—"Their horses are not tall, but of the size of our middling nags, short and well trussed, small headed, and very full of mettle, in my opinion far exceeding the Spanish jennet." My friend Mr. Oliphant, in his interesting narrative of Lord Elgin's Mission, confirms this statement, and gives the following curious account of the *manège* of a people as numerous as ourselves, and of whom, for 250 years, we have known nothing but their lacquer-ware and curious porcelain:—"As Lord Elgin had not yet seen much of the town, I accompanied him on shore on another tour of exploration. In the course of our walk we came to a large enclosure, and on entering it found fifteen or twenty men on horseback, galloping and curveting about a considerable area, apparently used as a riding school. This, we understood, was the constant

afternoon amusement of the 'young bloods' of Nagasaki. They were all men of fortune and family, princes and nobles of the land, and this was their Rotten-row. They rode fiery little steeds, averaging about fourteen hands in height, and took a delight in riding full gallop, and pulling up short, after the favourite manner of Arabs. The saddles were constructed on the same principle as they are in China, but with less padding. The stirrup-leathers were short, and the stirrups like huge slippers, made of lacquer. The bit was powerful, and the reins made of muslin, but strong notwithstanding. When we appeared two or three good-looking young men pulled up near us, and most good-naturedly pressed them upon us. I took a short, uncomfortable gallop upon one with a propensity to kick, and was glad soon to relinquish him to his smiling owner. We were much struck with the gentlemanlike and unconstrained bearing of these young men, who evidently wished to show us all the civility in their power."

From all the facts now detailed, the great probability seems to be, that in many countries there existed distinct races of the wild horse, which, in due time, their respective inhabitants reduced to servitude. Scattered over the greater part of the Old World, and consisting of widely-different varieties, and considering the extremely rude state of the intercourse, and more especially of maritime intercourse, of the early nations, most of whom were even ignorant of each other's existence, it is difficult even to imagine that all the horses of the world were derived from one single stock. Neither the Hindus or Arabs had carried their horses to the islands of the Malay Archipelago, although they communicated to them their religions and a very considerable portion of their languages. The Malays and Javanese did not succeed in conveying their horses to the islands of the Pacific, although they did a considerable portion of their languages. Close to them was the Philippine group, and to the inhabitants of this they communicated a considerable portion of their languages, and even a smack of their religion; but it remained to the Spaniards to bestow the horse upon them. The large and fertile island of Formosa is but eighty miles distant from the populous coast of China, but the Chinese had never occupied it until Europeans showed them the way to it only two centuries ago. They have ever since then occupied it, colonized it, and drawn large resources from it, but down to this day have not introduced the horse.

Attempts have been often made to trace the first domestication of the horse to a particular country, but the inquiry seems to me an idle and unnecessary one. Wherever the horse existed in its wild state, it would very easily be domesticated, and, consequently, in many different and independent localities. It was not found domesticated in America, or Australia, or the Isles of the Pacific Ocean, because in these parts of the world it did not exist in the wild state, and, in a rude state of society, it could not possibly have been conveyed to them from countries in which it was indigenous. The case was different with the dog: it existed, most probably, in all the countries in question in the wild state, and was consequently found in the domesticated state in all of them.

The era of the first domestication of the horse must have been very remote indeed, for it required but a very small amount of civilization in

the men who achieved it. This is sufficiently proved by the fact that some of the rude tribes of America had, within fifty years of the discovery of the New World, domesticated the horse, already become wild,—and that they have ever since continued to make use of it; and, by so doing, have been able to maintain a rude independence, assuming, in some degree, the nomadic habits of Arabs and Tartars.

The domestic, but not the wild or the feral horse, is a frequent subject of representation on the monuments of Egypt, estimated to be of an antiquity of some forty centuries; but this is very far from carrying us back to the first domestication of the horse, for when the Egyptian sculptures and paintings were executed, the Egyptians were in possession of many of the useful arts, and had even invented letters,—were, in fact, an ancient civilized people—and, for aught we know to the contrary, the horse may have been domesticated in Egypt four thousand years before the time in which it was represented on its monuments. If this reasoning be valid, the probability is that the horse was domesticated just as early in other parts of the Old World, from the British islands to Japan, as it was in Egypt.

The first use to which the horse would be put must have depended on the characters of the people and country in which it was domesticated. Riding must have been the first use to which it was put, for it is not easy to suppose that it would have been tamed and broken in without having been mounted. The purposes to which it would be used would be war, travel, and pleasure. It is only in very advanced periods of society that it is applied to agricultural and other useful labours. In this it is anticipated or superseded by the ox in most countries, and by the ox in conjunction with the buffalo in others. It is only in very advanced periods of society that it is used for draught, and this chiefly in modern Europe—a matter, however, which seems to be in some measure determined by the superior size, weight, and strength of the races of this part of the world. Throughout all Asia, and indeed throughout the whole of Eastern Europe, the horse is nearly unknown for draught, either in plough or carriage, while with ourselves it has justly superseded the slow and heavy ox—clear evidence of a superior intelligence and civilization.

In the ancient monuments of Egypt, the horse is almost always seen in draught only—a pair drawing a two-wheeled chariot, with a pole, in the manner of a curricle. A pompous display would seem to have been the only object. One or two samples only occur of a man on horseback, and then sitting not astride, but sideways, without bridle or saddle, and in mere frolic. But in due time the Egyptians had a cavalry, for when the king of Egypt pursued the Israelites, after their escape from bondage, he did so with horsemen as well as with chariots, and this is supposed to have happened about 1500 years before the birth of Christ. The ancient Britons had their war chariots, while Gauls, Numidians, and other contemporaries not more advanced, had cavalry, but not chariots. Whether cavalry or chariots were used in war was probably a matter of chance. I may here remark, that the mere capacity to construct a wheel carriage, however rude, is a fact which shows that in the days of Julius Cæsar we were not such arrant savages as we have been sometimes represented. We had not only the skill to construct chariots, but even to arm them with

iron scythes. The iron, no doubt, must have been rather scarce, for we used it at the same time as our only money, and probably valued it as highly as the Roman conquerors did silver.

So much for the origin of the horse, and I may now offer a brief comparison of his utility to man in the work of labour, as compared with that of other domesticated animals, a fuller account of which must, however, be delayed for another opportunity. The camel, unsuited for draught, is the beast of burden of the desert and of dry lands. It is wholly unfit for wet soils, and for countries with periodical rains: in the mud it slips, flounders, falls, and, lacerating the ligaments of the hip-joint, never rises. It is, perhaps, the only quadruped that cannot swim. In a civilized country, with good roads, it would not be maintained at all, and it must be pronounced to be the beast of burden of the barbarian only. So delicate is its constitution that in the Affghan wars it has been estimated that 50,000 of them perished.

The services of the elephant are, at the utmost, limited geographically to some thirty degrees from the equator, and are indeed unknown, except in India and the countries between it and China. Even in India the cold is so little congenial to it, that it is only by degrees it can be moved northwards with safety. Although preferring the plain, the elephant climbs hills and precipices with a success little to be looked for from its huge bulk and unwieldy form.

Yet, although the native of a warm climate, Hannibal succeeded in taking a number across the Alps, a fact which may lead us to suspect that his passage was an enterprise less arduous than is generally imagined. Of the number of thirty-seven which he brought into Italy, one only, however, survived the first battle, for even in the plain a heavy fall of snow had taken place which destroyed them. But the elephant, although a floundering and awkward swimmer, is a bold one, and swims across the Ganges and the Jumna without difficulty. One is therefore surprised to find the difficulty which Hannibal encountered in transporting them over so comparatively small a stream as the Rhone. The elephants, however, were African, a distinct species from the Asiatic, and the natives of a higher latitude and a drier country than the inter-tropical parts of India and its neighbourhood, the country of the Asiatic elephant; and this may possibly account for their antipathy to the water, and their capacity to sustain a degree of cold which enabled them to be taken across the Alps—implying a cold under which the elephants of Chittagong, Burma, Siam, and Ceylon would have quickly perished.

The elephant, naturally a timid and cautious animal, never could have been of much service in war: had it possessed courage equal to its bulk and strength, it would, of course, have trodden down whole battalions. But it is formidable only to the eye, while it is itself a huge target to be shot at. To ride it for any distance is, at least, a very severe exercise, for, although it has no other pace than a walk, the jolting of that walk is equal to that of a carriage without springs, on what the Americans call "a corduroy road." I have never heard of the elephant being employed for draught except in Ceylon, where one is yolked to a huge car for hauling materials for the construction of roads and other public works. In towns, and on frequented highways, the elephant, from his unwieldy size

and uncouth form, becomes a public nuisance, and it may safely be anticipated that, with good roads, its use will eventually be discontinued.

The horse is the universal hero of labour, suited for all kinds of work, and for their performance in every climate. His almost exclusive employment in labour is in itself evidence of a high civilization. With ourselves, by careful breeding, we have been able to produce races adapted to every assignable purpose—some that can draw three times as much as the elephant can carry, and some that are fleeter than the antelope. He is the only animal that enters the field of battle with us. He even partakes of "the rapture of the strife," and without him no great decisive battle could be fought, or, in fact, ever has been fought. "The glory of his nostrils is terrible. He paweth in the valley and rejoiceth in his strength. He hurries on to meet the armed men,—he mocketh at fear,—he turneth not his back from the sword. The quiver rattleth against him—the glittering spear and the shield. He swalloweth the ground with fierceness and rage; neither believeth he that it is the sound of the trumpet calling a retreat. He saith among the trumpets, On—on! and he smelleth the battle afar off, and heareth the thunder of the captains and the shouting." That passage, as you all know, is taken from the Book of Job. I cannot help thinking that the animal so well described in it, with glory in his nostril, and pawing with impatience for the charge, must have been no other than a true Arab. In fact, the scene of the Book of Job is laid in Edom or Idumea, which is now, and always has been, a portion of Arabia, although in contact with Syria. The patriarch was in reality a powerful Arab sheik, or independent prince, in possession of sheep, camels, and asses, by thousands; and the mention of the sword, and the "glittering spear," implying a knowledge of malleable iron, shows that his subjects were by no means such barbarians as were the Mexicans and Peruvians when first seen by Europeans. In the enumeration of the Patriarch's stock, it will be seen that horses are not named. Most probably they were rare at the time, and the luxury of the chieftains, and would no more be named than their wardrobe or jewelry and trinkets.

You will have observed, that, in the passage I have quoted from the Book of Job, I have omitted that part of the description of the horse which makes his neck to be "clothed in thunder." It is now considered to be a mistranslation, for it appears that the same word signifies in the Hebrew "thunder" and a "horse's mane." The translation ought to have been "flowing mane." The interjection, "Ha! ha!" too, appears to be a mistake, for that simply expresses wonder or surprise, which is by no means consonant with the feeling attributed to the horse at the moment of action. It ought to have been, "let us advance," or, "let us go on." These corrections of our version we owe to M. Ernest Renan, a distinguished French Orientalist, to whose translation of the Book of Job my attention was directed by my learned and accomplished friend the Dean of St. Paul's.

A comparison of the powers, for labour, of the different animals which man has employed to assist him, is not only a subject of rational curiosity, but one that throws a broad light on the condition and progress of society. These are the dog, the ox, the buffalo, the horse, the ass, the elephant, and the llama.

According to Captain Lyon, quoted by Sir John Richardson, an Esqui-

maux dog will draw in a sledge a load of 160 pounds, going at the rate of a mile in nine minutes, or near seven miles an hour. An English dray-horse will easily draw a ton on a good road, going however at not more than the rate of three miles an hour. In this case, the draught power of the horse is equal to that of fourteen dogs, while the pace of the dog is nearly seven times that of the horse; but the dog must have ice or frozen snow to travel over. On an ordinary road, he would probably be over-draughted with a load of twenty-five pounds, while his speed would hardly equal that of the horse. In this case it would take ninety dogs to equal one horse; and the cost of keeping them would be as great as that of keeping four packs of fox-hounds.

In India it has been ascertained that the average burden of an ass is 100 lbs.; of a bullock or mule, 200 lbs.; of a camel, 400 lbs.; and of an elephant, 800 lbs. One elephant, then, is equal to two camels, to four bullocks or mules, and to eight asses. The respective merits of these animals as beasts of burthen cannot however be measured by their mere capacity for bearing a load. The first cost of the elephant, for example, is ten times that of a camel, and his keep costs as much as that of eight camels. This is indeed, in some measure, compensated by the better constitution and higher longevity of the elephant, whose length of life is full ten times that of the camel—equal, indeed, to that of man himself; that is, three score and ten, or even four score. Had his life, I may add, been proportioned to his bulk, it ought to have been a great deal longer, for it has been ascertained that the average weight of an Indian elephant is equal to that of twenty-four men, each of ten stone, or to a subaltern and his whole section of light infantry.

In Thibet, but there only, a variety of large sheep is used as a beast of burden, although it might well be supposed that its own immense double fleece would be an all-sufficient load for it. In the New World there is but one beast of burden, the llama, a diminutive species of camel, by the structure of his foot and by his constitution fit only for mountain regions. His average load is sixty-five pounds. One camel of the Old World, then, is equal to six of the New. It will appear, from the facts now stated, that an English dray-horse, on a good road, will draw the united burdens of two elephants, one camel, and five oxen. His power of transport is superior to that of five of the best camels that Arabia ever produced, and to that of thirty-four of the camels of the New World.

For riding, the superiority of the horse is equally great. The elephant, his only pace, walking, will travel at the rate of four miles an hour, but it would distress him greatly to continue it for twenty miles. It would take him five hours to perform this journey, which the horse would perform in one hour. Of the domestic animals, the dromedary, or common camel, is the one that in speed approaches the nearest to the horse, and its pace is probably equal to about one-half that of the horse. The messenger camel will travel, it is said, one hundred miles in twenty-four hours; but an English blood-horse has been known to perform a journey of double that distance within the same time. But in the case of the camel, the pace is "a killing" one; not to the animal, but to the man; for it is said that the life of the professional camel-rider, the Shuter Suwar of the Persians, does not exceed five years' duration.

But the horse has been at length surpassed, although by no means superseded—indeed, in no degree even displaced, for it has increased in number—by a new power. A few years ago, a meritorious operative, a heaven-born engineer, invented, almost created, a machine, which in speed eclipses Eclipse, and leaves Flying Childers "nowhere,"—which can draw with ease the load of a thousand, or, if need were, of ten thousand elephants, and which, in one-fourth part of the time, without fatigue to itself or to the rider, can perform the feat which saved Turpin's neck by proving an *alibi*. That machine is now at work in the native country of the slow camel and slow and ponderous elephant, a creditable tribute to George Stephenson and the nineteenth century. The son of this man of genius, almost the equal of his father, was lately laid in the spot which Nelson thought was equivalent to a dukedom. Perhaps you will be of opinion that the remains of the father ought in justice to repose alongside those of the son!

I have now but a few words to add, on the supply of the English breed of horses for cavalry purposes. The English horse, like the Englishman himself, is a thorough mongrel, and as the horse has, beyond all question, improved by crossing, we may safely conclude that the being has suffered no detriment by it, that has produced a Shakespeare and a Milton, a Chatham and a Burke, a Watt and a Stephenson, a Marlborough and a Wellington, a Blake and a Nelson, and which will assuredly produce their equals whenever their country shall have need of their service.

We, who formerly imported all our best horses, are now the only people who export good ones, and we supply all nations that have sense and ability to buy. I have looked at our export of horses for the last year for which the public accounts are made up, and find the number exported to have been 1,574, and their custom-house value to have been £117,422. France had out of these 755, and Belgium and Germany 611. I suspect that the officers of Her Majesty's Customs are not good judges of the value of a horse, for the valuation of those furnished to France was short of £50,000, or at the average of £66 a head, which is much too low a valuation, for I have every reason to believe that one of the horses exported was the "Flying Dutchman" (of whom it never could be said that, like his namesake, "he was nowhere"), which was sold to the French for the sum of £5,000. It is certain that we have turned the tables on the French since the time of Charles II., when a Frenchman was the master of his Majesty's riding-school, and pronounced by old Evelyn to be the first judge of a horse in Europe.

Wherever the Anglo-Saxon race has settled, the improved English horse has been introduced, and, wherever climate and pasture have been favourable, with success. India, which has most need of the cavalry horse, is not one in which the introduction of the English horse has been most successful. A great stud has existed in Bengal for sixty years, without ever having been equal to furnish even a sufficient supply for the European cavalry of that government. The stud of Madras, situated on the table-land of Mysore, is upon a far more rational and economical scale than that of Bengal, consisting only of Arab sires. The grasses of India are neither abundant nor nutritious; the plain proof of which is, that the flesh of no mere grass-fed animal is fit for the table, that of the

stall-fed animals alone being so. But, even were the conditions more favourable for breeding than they are in India, studs are not among the establishments which it is within the legitimate province of any government to maintain.

After the United States of America, which in breeding the English horse stands next to England itself, the most eminent success has attended its rearing in the Cape of Good Hope and Australia. The Cape farmer, who used to drive his produce to market at a snail's pace, with a team of sixteen oxen, now does it at a smart trot, with eight English-bred horses —a royal team; in all likelihood, better cattle than those which conveyed Charles II in state (some lovely Thaïs by his side) from Whitehall to the City. The success has been still greater in Australia, where the pastures are more spacious and the grasses more nutritious. In the course of the year 1858, the Australian colonies furnished for the Indian Cavalry 2,563 horses, at the average price, on the spot, of 30*l.* a head, and when landed in India, at from 80*l.* to 90*l.*; being a smaller price for a better horse than that supplied by the Government stud.

Here, then, we find a country which, seventy years ago, had not only no horse, but no native animal more respectable than a kangaroo, the brain of which, the great naturalist Mr. Owen tells us, is of no higher order than that of a reptile, exporting more horses than England itself, and adding their value to five millions' worth of sheep's wool and twelve millions' worth of gold. Two generations ago its population consisted of a few savages, the very lowest in the scale of humanity, and now its inhabitants are Anglo-Saxons, amounting to near a million. A century hence, this continent of the Antipodes will contain more people than the United Kingdom now does; and, unless they differ greatly from their progenitors, they will be meditating the conquest of the whole Indian and Philippine archipelagos, giving law to China and Japan, and quarrelling with New Zealand—by this time as crowded with ambitious Anglo-Saxons as itself.

Friday, February 24th, 1860.

Major-General Sir R. J. DACRES, R.A. K.C.B., in the Chair.

THE CAMPAIGN OF MARENGO.

By Lt.-Col. E. HAMLEY, R.A., Staff College, Sandhurst.

WEIGHTED with all the cares of revolutionary France—suppressing factions, restoring public credit, forming an administration, developing the internal resources of the land, controlling the movements of her armies, and negociating with the powers of Europe—it was amid such occupations that Napoleon, at thirty-one, after a few months' experience of almost absolute rule, prepared to illustrate the unsuspected resources of strategy by a novel and startling application of its principles in the campaign of Marengo.

Although in his first Italian campaign his genius for war had at once appeared fully developed—though he sprang on the theatre of the world, as Pallas on that of Olympus, armed at all points—yet he was then wielding materials which he had no share in creating; he was directing an army and a system formed by the necessities of the French Republic, of which he was himself only an instrument. Now, as First Consul, he was responsible to his own inspirations alone; but his short tenure of power had afforded him no opportunity to remodel the system, and he had to make the best of it as it lay ready to his hand. It was not till the days of the Empire that he was enabled to execute his vast designs with instruments formed and chosen by himself; when the world beheld the extraordinary spectacle of a great country bending all its resources, its wealth, its men, and its materials, to the purposes of war, at the direction of the greatest military genius in existence.

While Napoleon had been in Egypt, lured thither by his dream of Eastern dominion, all the ground won in Italy by his brilliant campaign of 1796 had been recovered by the Austrians. In the beginning of May, 1800, the only French troops remaining in Sardinia were the garrison of Genoa under Massena, who were blockaded by 25,000 Austrians, under General Ott on the land side, and by Lord Keith's squadron on the coast. Suchet, with the remainder of the French army of Italy, had been driven struggling out of the Apennines into Provence, and was now holding the frontier line of the Var with 14,000 men against treble their numbers. On his left, General Thurreau with 4,000 men occupied, on the French side of the Alps, the pass of Mont Cenis, opposite Turin. These were all the French troops in presence of the enemy. The Austrians, besides their corps before Genoa and on the Var, held the fortresses south of the Po with considerable garrisons, and had posted detachments opposite every pass of the Alps, from the St. Gothard to Pignerolo. Their forces in

Sardinia, numbering something more than 100,000, were thus extended on a line, from Nice to Bellinzona, of more than two hundred miles.

This faulty extension of the Austrians promised, to a general who should either adequately reinforce Suchet on the Var against their left, or advance by Mont Cenis against their centre, a favourable opportunity for arresting the tide of success, by throwing back a portion of the enemy's line before its dispersed fractions could combine. But France possessed no apparent means of doing this, for her only army was on the Rhine, under Moreau. Yet the idea which had taken possession of Napoleon's mind was no less than to attempt, not the repulse, but the destruction of the Austrian army of Italy, and, moreover, to accomplish it in time to save the garrison of Genoa.

The first thing necessary was troops. In the form of depôts, reserves of regiments, conscripts, and skeleton-corps exhausted by former campaigns, there existed, in various parts of France, sufficient numbers of soldiers to form, along with the brigades set free by the pacification of La Vendée, an army of 40,000 men. But to assemble these openly would be to place Austria on her guard and render them of no avail. Profound secresy was therefore an essential condition of even the promise of success; and it was essential also to select for the assemblement a place near the intended point of operation.

North Italy is divided naturally into three portions, called by strategists zones. The lowermost, or Napoleon's right, lies between the sea and the Apennines, the centre between the Apennines and Po, the left between the Po and the Swiss Alps. Each of these portions is isolated from the rest by natural obstacles, and may, therefore, include all the chief operations of a campaign, and the advantages of selecting either of them might thus be weighed separately. The limited space between the Apennines and the sea was favourable to the force numerically inferior to the enemy, as Napoleon's must be; moreover, in that mountainous region the superiority of the Austrians in cavalry and artillery was rendered nugatory, while the foot-soldiers of the Republic, who had always maintained their pre-eminence, would fight on the ground most favourable to the exercise of their activity and intelligence. But successes here must be slow; the Austrians would constantly, when pushed back, be reinforced through the passes of the Apennines; and in retiring they would still cover the siege of Genoa. If beaten, however signal their defeat, they would be driven along their proper line of retreat to the shelter of their great fortresses in Lombardy. Decisive success then was not to be hoped for here, and nothing short of absolute triumph would satisfy the aspirations of Napoleon.

In the space between the Apennines and Po, three fortresses, those of Turin, Coni, and Alessandria, existed, each a stumbling-block in the path of an advancing army. This, too, was the centre of the Austrian line; and the centre of a line can manifestly be reinforced by the other portions more easily than either extremity. The fortresses would afford the separated corps time to reassemble; by holding the passes of the Apennines they would prevent Suchet from relieving Genoa, and, if defeated, they would still, in falling back, cover the siege, and would, as in the former case, retire on their proper line of retreat. Neither, then, was a great and swift success to be hoped for here.

In the remaining zone, the space between Switzerland and the Po, the Austrians, besides being numerically weakest, were most widely extended. This then was the weak point of their line, for no fortresses existed on it; but it was also the most difficult of attainment, sheltered as it was by the Alps, the rugged passes of which seemed to forbid the passage of an army. But the Austrian line of retreat, owing to the geographical features of North Italy, obliqued from the Austrian centre and left across their right rear. If the right could be forced or turned, Napoleon would place himself across that line of retreat, and force them to a battle, in which a simple repulse would be for them annihilation. Here, then, lay the condition of success, the garden of the Hesperides, but guarded by a line of enemies, whom a whisper of his design would increase to a host, and by an external barrier of mountain and snow which seemed insurmountable. But it was a characteristic of Napoleon to disregard all paths, except the pre-eminently decisive one: moderate successes, which would have constituted the glory even of great men, could not divert him from his higher aim; and having once detected, as he always did, the point where the greatest result lay, he thought, henceforth, only of overcoming the intervening obstacles. All or nothing was the condition on which he played his tremendous game; so many chances did his genius accumulate in his favour, that if he should not win he was still secure against heavy loss; but with the additional chances which fortune, in those earlier days, delighted to bring to him, he always won.

He looked round then to calculate his means for the achievement; if to all appearance insufficient, nevertheless a powerful genius, urged by a powerful will, must make them suffice. All the troops he could assemble in France to form the so-called army of reserve, 40,000 strong, were still too few for his purpose. But Moreau was preparing to cross the Rhine with 130,000 men to attack Kray; if Moreau should be successful, he could spare a reinforcement for Italy; and that he might be successful, Napoleon suggested for him a plan of campaign at once audacious and prudent, which, executed by its contriver, would have been immediately and signally decisive. But the genius of Moreau differed from the genius of Bonaparte; of a cold and prudent resolution, no enthusiasm nor heroic greediness of glory excited him to risk a hazardous throw. He, too, had his plan, in the excellence of which he put his faith—less brilliant, more cautious, and apparently, though not really, more prudent; and Napoleon's sagacity leading him to recognise the truth, that, where so much depends on execution as in war, a plan should be executed by him who conceives it, he relinquished his own design, and Moreau was left to the development of his cherished idea.

Over the St. Gothard and the Simplon, the two St. Bernards and Mont Cenis, there were, in those days, no roads, but only rugged paths, where mules toiled upward, and slid and scrambled downward, in single file. Switzerland had been for two years occupied by the French, and all these passes were therefore available. The St. Gothard was reserved for Moncey, who was to bring the corps from the Rhine—it remained to choose the point for the passage of the army of reserve. That point must be such as to combine the advantages of affording the greatest facility to the real design, and giving a false impression to the enemy. The design

was to unite with Moncey at Milan, and from thence to cross the Po. Napoleon was resolute to grasp the whole Austrian army, by interposing between it and its great fortresses behind the Mincio. Ott's corps besieging Genoa would, if compelled to fall back by the approach of the French, retire across the Po at Piacenza; Napoleon must therefore interpose not higher up the stream than Piacenza, or Ott's, and perhaps other corps, would elude his grasp. Milan, then, was his aim, as being the nearest point to Piacenza where he could unite with Moncey; but, while directing his march thither, he must conceal it as long as possible from the Austrian commander, who might otherwise anticipate him by the right bank at Piacenza, or intercept his own communications with France. Now the St. Bernard pass leads upon Ivrea, where the road branches—one branch goes to Milan, one to Turin. This fact, insignificant perhaps to the uninstructed eye, decided the line of march of the army. Once arrived at Ivrea, the advanced guard should move towards Turin, while, behind the screen of its extended front, and covered by the Po, the army should advance on Milan.

This plan had been matured some time before it was put in operation; and during April the troops were moving on the point of assemblement. That point was Lausanne, one march from the foot of the St. Bernard. But that point, as before said, must be carefully concealed, and Napoleon diverted attention from it with the careful craft which formed one element both of his character and of his success, and which seemed to partake both of littleness and greatness—little in its dissimulation, great in its sustained energy and its contribution to a grand result. He gave out, with great ostentation, that there was to be an Army of Reserve, and that it was to assemble at Dijon, for he thought it far safer to give the spies a wrong direction, than to attempt altogether to hide the traces of his design. Dijon might be supposed to be a convenient place from whence to reinforce the army of the Rhine; it was therefore declared by messages to the legislative body and the senate, by decrees, by publication in the newspapers, and by intimations of all kinds, that the point of concentration of the army of reserve was Dijon. Thither flocked the spies and scouts, who beheld there, in the beginning of April, a staff without an army, and in the course of the month a body of a few thousand conscripts and retired soldiers, many of them maimed, whom Napoleon ostentatiously reviewed. Then the sagacious spies, concluding that they had seen through the transparent deceit of the First Consul, published, in all directions, their discovery of the fact, that the Army of Reserve was a phantom. It was believed in Vienna, in London, even in Paris; Europe was filled with derision at the absurdity, and its capitals exhibited everywhere caricatures on the subject, one of which represented a small boy, and an invalid with a wooden leg, under which was written "Bonaparte's Army of Reserve." Enemies and spectators enjoyed the joke, while through France were marching, by devious routes, converging on the destined point, the men who were to win Italy at Marengo. Passing in small bodies, they attracted no attention; and, as their destitution was extreme, they found at one town shoes awaiting them, at another coats, at a third new muskets, but at no one place stores of sufficient magnitude to excite suspicion. These arrangements all resulted from the forethought of the First Consul,

whose irrepressible energy forced itself into the minutest details of the project.

The army assembled at Lausanne unsuspected. The guns, with their equipments, came from the arsenals of Auxonne and Besançon, where they were supposed to be prepared for the army of the Rhine. Berthier was the nominal commander, though all the orders issued from Napoleon, who arrived on the 13th of May, and received the report of General Marescot, an engineer, who had been dispatched to reconnoitre the passes. He was impressed with the grandeur of those tremendous solitudes, and talked of the glaciers and avalanches; but Napoleon, intent upon one thought, asked him but one question, "Is it practicable?" "Yes," was the answer, "but with extreme difficulty." "Let us start, then," said the First Consul. He had that day been notified that Moncey, detached with 15,000 men from the army of the Rhine, was moving through Switzerland towards the St. Gothard. The troops had ample supplies. In the departments of the Rhone, two million rations of biscuit had been made, two hundred thousand of which had, with much parade, been forwarded to Toulon for the garrison of Genoa, whilst the remainder was secretly conveyed up the Rhone to Geneva. Each soldier carried six days' rations; corn, oats, and brandy in immense quantities had been collected between Geneva and the foot of the Alps, whither live cattle in sufficient numbers had also been driven. No cause of delay remained, and the army begun its march at once in a succession of divisions, the advanced guard being under Lannes, afterwards one of the most famous marshals of the Empire, and always foremost in battle, till a cannon-shot shattered him at Essling; while the rear-guard was under Murat, the *beau sabreur* and future king.

All was clear as far as St. Pierre, a village at the foot of the Alps; but there the grand difficulty of the enterprise began. There commenced the narrow path that winds like a thread over the St. Bernard, up which horses could only pass in single file, led by their riders, and where artillery consequently could not pass at all. But forty thousand men would be of no avail in Italy without guns, and the transport of these had been provided for. Half a company of artificers posted at St. Pierre took the carriages to pieces, which were packed on mules, while the guns were placed in trunks of trees hollowed to fit them, with grooves to receive the trunnions, and were drawn each by a hundred soldiers. Lannes, with his vanguard, passed on the night between the 14th and 15th. Then the silence of those desolate ravines, unbroken for centuries except by a solitary group of travellers and guides, was invaded by the clangour of arms and the tramp of a multitude. Upwards they filed in long array; the foot-soldier laden with his weapons, his biscuit, and his ammunition, a weary load; the horseman drawing after him his stumbling steed; and the tree-trunks, containing the guns, each of which tasked at every turn the strength and dexterity of its hundred men. But the troops were filled with the enthusiasm and ardour for glory generated by the nobler elements of the Revolution. These mountains, with their robes of snow, must be passed before they could conquer Italy under their redoubted general—and the song and talk passed onward up the steep, uninterrupted, except where some yawning crevasse opening in the path threatened destruction, or where an avalanche, loosened by the sun

of May, filled the crags and valleys with the reverberations of its fall. At the summit a surprise awaited them. The First Consul had despatched to the hospitable monks of St. Bernard a considerable sum of money for the purchase of provisions, and they had fulfilled their mission by catering liberally for the army. Long tables were spread out, where every soldier found bread, cheese, and wine, and went on his perilous way rejoicing. So grateful was Napoleon for this seasonable aid, that not only did he, in passing the convent, leave a munificent sum to be devoted to the generous purposes of the establishment, but, in the following year, he built two similar hospices, one on Mont Cenis, the other on the Simplon, each containing fifteen monks, and endowed with a considerable income from the lands of the Cisalpine Republic.

By the 20th all the divisions had passed and descended the slopes of the Italian side. Many horses slipped over the precipices, or were engulfed in the yawning crevasses, but few soldiers perished. At St. Remi, a village at the foot of the St. Bernard on the Italian side, another half company of artificers, who had passed with the advanced guard, were waiting to remount the guns. Lastly, on the 20th, the First Consul, who had till now waited at Lausanne to regulate the march and supplies of the troops, crossed also, not, as represented in popular pictures, mounted on a fiery and chafing horse, with a cloak streaming in the wind, but on a mule led by a peasant-guide from the valley, and clad in the grey riding-coat which has become classic. It was time that he should cross, for an unforeseen impediment had made his presence necessary.

Lannes had twice encountered detachments of the enemy, first at Aosta, where he found some Croats whom he drove to the bottom of the valley, and, next, at the little town of Chatillon, where he defeated an Austrian battalion, taking many prisoners. The march now lay along the fertile, green, well-watered valley of Aosta, and the troops were advancing in the highest spirits, when they came upon a very lion in the path—the fort of Bard.

The officers charged with the reconnoissance of the route had been unable, of course, while the Austrian detachments barred the path, to extend their survey so far as Bard. Some Italians had represented it as the only spot where any difficulty would be likely to occur, but it had never been regarded as offering a serious impediment. It stands in a narrow portion of the valley, where all the streams of the region of the St. Bernard, uniting in the Dora Baltea, have cut for themselves a narrow channel as they rush onwards to the Po. A huge pyramidal fragment, separated apparently from the summit of one of the inclosing mountains, lies on the bank of the stream, leaving between its foot and the wall of rocks room only for the little fortified town of Bard, which besides its own proper defences is swept by the cannon of a fort constructed on a triple line of defence on the top of the conical rock, and almost unapproachable. Such was the barrier that now closed the path of Lannes. Twice he hurled his grenadiers against it, but, though he took and held the little street which constituted the town, he made no impression on the fort, which swept the street with its guns, and which only desisted from its fire out of consideration for the inhabitants. General Marescot, the engineer, summoned to the spot, declared the fort to be almost impregnable. A

reconnoissance amid the neighbouring mountains revealed but one path over the Albaredo rock, which presented difficulties even greater than that of the St. Bernard, for it had hitherto been trodden only by goatherds and shepherds. Berthier, then commanding in the absence of Napoleon, issued orders in alarm to stop the advance of the approaching columns and material, and sent messages to apprise Napoleon of the disastrous and seemingly fatal impediment.

But the First Consul had not crossed the St. Bernard to be stopped by Bard. The fort must be taken or turned; other paths from Aosta existed, debouching lower in the valley—and he would hear of no delay. Arrived at the front, he reconnoitred the obstacle from the Albaredo mountain; saw that Bard was secure against a *coup-de-main;* and instantly ordered the cavalry and infantry of Lannes to advance by the path he had himself ascended, and which had been rendered practicable for single horses by the incessant labour of fifteen hundred men. But the guns could not cross it; neither could they again be taken to pieces and transported as they had been over the St. Bernard. The commandant of the fort of Bard, watching with mortification from his pinnacle the filing of a whole division past his post, sent word to Melas, the Austrian commander, pledging himself that not a single gun should pass. Nevertheless they did pass. An attempt to convey a gun through the street under cover of the darkness was revealed by the clatter of its progress, and stopped by the fire of the fort. But the precaution having been taken of covering the street with straw and dung, and of wrapping the pieces themselves in tow, to render their passage noiseless, the whole artillery, dragged by the gunners, passed through in the night. The investment and reduction of the fort was then left to a force of conscripts under General Chabran, who had passed by the Little St. Bernard, and it capitulated on the 1st of June.

Meanwhile Lannes, pushing on, had attacked and captured in two assaults, with his infantry, the town and citadel of Ivrea, the fortifications of which were still in the ruinous state to which Vendome had reduced them nearly a hundred years before. Reinforced by artillery from the rear, Lannes again pushed on, while the whole army assembled behind him at Ivrea.

Thus Napoleon had attained the point from whence he hoped to derive two main elements of success, which were 1st. facility of movement upon Milan, and 2dly. the means of deceiving the enemy into the belief that his object was Turin. In furtherance of this latter object, General Thurreau, crossing Mont Cenis at the same time that the main army passed the St. Bernard, served to perplex the enemy, while he also protected Napoleon's right flank. But his was not the only detachment from the main army. Two thousand Italians, branching off from Chatillon when the army passed through, advanced by Grassoney to the valley of the Sesia; a brigade of French occupying the Swiss province of the Valais, passed the Simplon under Bethencourt, moving on Domo d'Ossola; and thus the main army stretched a hand towards Moncey's force, which was coming by the St. Gothard. The latter, forming the left of the army, was secured by the successes of Moreau, who crossing the Rhine on the 1st of May had, in a succession of contests, pushed the Austrians, whose left had at first rested on the Tyrol, back upon the Danube. Thus the whole French

force was at once concentreing and enveloping the Austrian right. It was in a condition to fight a great battle if attacked, and if defeated could retire through the passes, with the loss only of the guns: while Napoleon's strategical foresight and dexterity rendered a battle very unlikely till the moment arrived when it would suit his purpose.

On the 14th of May—while the French were at the foot of the St. Bernard preparing to commence the ascent—Melas had arrived at Nice, hoping by his superior weight to press Suchet from the Var, and to have the glory of invading the soil of France. His army was still engaged in three operations. His right and centre were watching the passes of the Alps, his left was pressing Suchet, and, in the rear, Ott pushed the siege of Genoa. The garrison, under Massena, displayed extraordinary constancy. Their sufferings from starvation were frightful ; all the horses, and even dogs, cats, and rats, had long been eaten, and the troops were reduced to a horrible compound of starch and cocoa found in the warehouses of the city, while the inhabitants, denied even this wretched and revolting sustenance, maintained a feeble flicker of life by soup made of herbs. A great number of Austrian prisoners were in the place, whose sufferings rendered them dangerous. Massena placed them in hulks which were moored under his guns, and one of the most dismal features of the siege was the howling raised by these unfortunate men in the pangs of starvation. But though surrounded by sights of horror and under a pressure of daily accumulating suffering, and threatened, moreover, with the mutiny of a garrison who could no longer bear their privations, Massena never flinched, showing still a good face to the enemy, encouraging the fainting troops, and refusing to hear of surrender. Their only hope now lay in Napoleon; he was long in coming, but he surely would come at last: eagerly they looked for him, and once a storm in the Apennines brought them all, with their chief, to the ramparts, for they believed the thunder in the hills to be the cannon of Bonaparte.

A letter from Massena describing the sufferings of the garrison, and saying the place could not hold out beyond the 24th of May, being intercepted about the middle of the month, first revealed to Melas the existence of an army of reserve, which he, in common with all Europe, had hitherto entirely disbelieved. Still he thought it a force of no immediate importance, and a report that Berthier was advancing to reinforce Suchet prevented him from changing his arrangements. Any rumours which might come of the movement on his right did not disturb him—he believed it to be merely a feint to draw him from his expected successes, and he retained his grasp on them, while amid the Alps was gathering a cloud, having in its breast a bolt which was to render the doom of the army of Melas as certain as that of the hosts of Sennacherib.

At length, on the 18th, a report from Kaim, the general commanding in and about Turin, warned him of the approach of a considerable force by the Valais. He thereupon sent two divisions to reinforce the centre, by the Col di Tenda, and proceeded himself to Turin, leaving General Elsnitz with 18,000 men to oppose Suchet on the Var. The reasons for these changes were these :—If he left a force on the Po inferior to that of the French advancing from the Alps, the latter might succeed in forcing their way down the river, and cut off the retreat both of the

corps on the Var and of that besieging Genoa. Had he known the magnitude and design of Napoleon's operations, he would have marched his whole force on the Po; but he did not yet know it, and to abandon the Var was to leave the road to Genoa open to Suchet, who would then relieve Massena. It is easy to conceive how hard it must have been for Melas to relinquish the seductive prospect of invading France at the approach of a force whose numbers he did not know, and on whose presence he had never calculated. He therefore, as most others would have done, clung to his original design to the very last.

Two things perplexed Melas when he arrived at Turin,—the advance of Thurreau by Mont Cenis, who had driven back an Austrian detachment posted at Susa, only one long march from Turin, and the capture of Ivrea by Lannes. The latter operation had been achieved without artillery; and it seemed highly improbable that the main advance would be unaccompanied by guns, especially as he knew the fort of Bard to be still uncaptured. He believed, therefore, that Lannes was the leader of a detachment, and that Thurreau commanded the advanced guard of the invading army. Thus the stoppage of the artillery at Bard, seemingly so unlucky, actually contributed to veil the design of Napoleon. Melas directed his attention towards Susa, and further reinforced the detachment there, which already greatly outnumbered Thurreau's.

But on the 26th May, Lannes, reinforced at Ivrea by a division with artillery from the rear, again advanced,—not towards the real point, Milan, for that would at once have revealed the plan, which might then have been easily disconcerted,—but towards Turin. On the road he attacked the Austrian detachment under General Haddick, at Romano, on the Chiusella, and, driving him behind the Orco, pushed on to Chivasso, where, as if to cross the river, he seized a great number of boats on the Po.

Hitherto, on the supposition that the main army was advancing by Susa, Melas dared not detach a considerable force against Lannes, because the centre thus weakened might be broken, and Napoleon might interpose between the forces north of the Po and the corps of Elsnitz and Ott. But the fact of French guns being engaged at Romano proved that the main operation was by the valley of Aosta, for whèrever one gun had passed fifty might follow; and Melas now knew that Napoleon was present there in person.

To Melas then, thus aware that a powerful French Army was moving on Ivrea and Chivasso, the following considerations should have presented themselves:—First. If Napoleon was aiming to advance on Turin, Melas could assemble his army from the Var from Genoa, and from the valley of the Po at Asti or Alessandria, so that the opposing armies, supported each on its proper base, might put the fate of Piedmont to the issue of a battle, where the Austrians, resting on their fortresses, ought, with their concentrated position, their very superior cavalry, and their veteran troops, to prevail. Secondly.—If Napoleon's aim proved to be Milan, Melas, with his army united as before, might act by the Tesino upon Napoleon's communications; when the French, if defeated, would have no retreat except by the St. Gothard pass, in which they must abandon their artillery. Lastly.—If Napoleon should decide to operate by the right

bank of the Po, in Melas's rear, the Austrian general had every facility to operate by the Tesino and Adda, and thus re-open the communications of the army, by abandoning Piedmont for the moment.

But in all these suppositions the first condition of success was the prompt retreat of Elsnitz from the Var on Coni, or the Col di Tenda, or even on Fossano, in order to effect his junction with Melas whenever it might be desirable, else he would be cut off. But Melas could not yet prevail on himself to withdraw the troops from the Var, thus uncovering the siege of Genoa, which must in that case also be abandoned. He persuaded himself that Napoleon's aim was to unite with Thurreau upon Turin; and that, by standing fast around that city, he might give Ott time to take Genoa. When that should be effected, there would be nothing to prevent him from recalling all his troops from the country south of the Apennines, and uniting them to his main army.

In this view, up to the 28th May, his instructions to his generals were to fortify Moncaglieri, Carignano, and Casal, points on the Po above and below Turin; and he ordered Wukassowitch, who commanded the forces (10,000 in number) in the valleys of the Sesia and Tesino, to defend the Tesino as long as possible (for Melas did not yet know of Moncey's march to turn the line of that river), and, when obliged to give way, to fall back to Pavia and pass the Po there.

By that time, however, Wukassowitch was in no condition to obey his orders. His detachments were posted in the Tesino valley watching the St. Gothard, at Domo d'Ossola opposite the Simplon, and in the valley of the Sesia. The latter force was now effecting its retreat before the French columns that threatened to envelope it. The detachment at Domo d'Ossola, attacked in front by the force from the Simplon, while the Italian brigade from Grassoney menaced its rear, hastily retired across the Lago Maggiore; and while his troops were thus dispersed the advanced guard of the French crossed the Tesino at the moment when Moncey's vanguard engaged his right at Bellinzona.

To keep Melas in the delusion that Turin was the object, and to mask the advance on Milan, Bonaparte ordered Lannes on the 28th to attack Haddick on the Orco. He also extended a "curtain of observation" in the shape of a line of detachments along the Po, through which he could observe the enemy, unseen himself. Its front thus covered, the army defiled from Ivrea, on the Milan road. Murat's rearguard now became the advanced guard and moved on the Tesino, near which it formed on the 30th May, followed by the divisions of Loison and Victor. It was in anticipation of such a movement that Melas had ordered Wukassowitch to defend the Tesino; and it was in reliance on his lieutenant's ability to check the enemy there, that he still remained with so large a force about Turin. But all the troops available for the defence of the river were some cavalry, the detachments being scattered, as already related, by the French advance; the nearest troops were those from Domo d'Ossola, which were marching down the bank. The Tesino is wide, deep, and rapid; and, though a canal from Oleggio conveys great part of its waters to Milan, it continues to form a formidable obstacle to an army. The canal runs parallel, or nearly so, to the river for some distance, and the Austrian cavalry commander, fearing to engage his men in that narrow

space, placed only some picquets there. Murat, having pushed his cavalry parties far up the stream to divide the enemy's attention, directed, on the 31st May, one division on Turbigo and another on Buffalora. With the aid of some small boats the adjutant-general, Girard, transferred himself and a few men to the left bank; he was supported, little by little, by a regiment, and by the fire of batteries from the other side, and the cavalry fell back before him, crossing the canal. The Austrian detachment from Domo d'Ossola, hearing the firing, hastened its march, and reached Turbigo in time to drive Girard's men from the village; but he defended the canal bridge till the whole division crossed to his assistance, and finally repulsed the Austrians, who retired on the Adda through Milan, throwing a garrison into the citadel as they passed. Wukassowitch sent orders to the detachment pressed by Moncey at Bellinzona to retire by Varese and Monza on Cassano. On the 2d June Napoleon entered Milan.

Pursuant to his orders, Lannes, on the 28th, attacked Haddick vigorously on the Orco, and at the close of the action he seemed resolute to resume the attack next day. But, immediately after its close, he drew his division together, and followed the direction of the rest of the French army marching from Chivasso, by the road that borders the Po, on Pavia, at which place he seized considerable stores, 8,000 muskets and 200 guns, forty of which were field-pieces.

The Army of Reserve, with the exception of Thurreau's force, which was still at Susa, and Chabran's conscripts which after the fall of Bard were ordered to Ivrea to cover the communication with the St. Bernard, was now assembled in the space between the Tesino, the Adda, and the Po. The retreat of Wukassowitch left the road on Milan clear for Moncey; nevertheless, he came but slowly. While awaiting him Napoleon made the following dispositions.

Duhesme and Loison pushed Wukassowitch back on the Mincio, and drew up before Pizzighitone, Cremona, and the tête-de-pont of Piacenza, all occupied by Austrian detachments. Napoleon organised a civil government at Milan, took measures to counteract the designs of the enemies of France there, and made arrangements for the supply of his troops. These matters occupied six days. On the 6th and 7th of June he reviewed Moncey's troops, as they came in by regiments; and he issued an order, of which the following is a part:—

"Soldiers!

"One of our departments was in the power of the enemy; consternation reigned over the whole of the South of France.

"The greater part of the territory of the Ligurians, the most faithful friends of the Republic, was invaded.

"The Cisalpine Republic, annihilated by the last campaign, was become the sport of a ridiculous feudal domination.

"Soldiers! you march—and the French territory is already free! Consternation and dread are succeeded by joy and hope in our country.

"You will restore liberty and independence to the people of Genoa, who will be for ever delivered from their inveterate foes.

"The enemy, panic-struck, hope only to regain their frontiers. You have taken from them their stores, their magazines, and their reserves of artillery.

"The first act of the campaign is ended.

"But shall the violation of the French soil pass unpunished? Will you suffer those soldiers who have carried terror into your families to return to their firesides? Well, then! march to meet them—oppose their retreat."

This bulletin, bombastic, as usual, in tone, sums up, not unfairly, the results of his operations thus far. Three weeks before, these kingdoms were passive under the domination of a hundred thousand Austrians, who, confident of their hold on Italy, aimed at invading France. The mere *direction* of Napoleon's line of march, had, without any general collision with, or even sight of, the main body of the enemy, relieved France, and forced Austria to abandon all her acquisitions. Such are the results of the principles of strategy applied by a master of the science. Had he now been content simply to wait at Milan, he would have seen the Austrians descend the right bank of the Po to rest on Mantua and the Mincio, when, joined by Suchet and the garrison of Genoa, he, with his back towards France, would have faced them with 80,000 men ready to dispute all attempts to recover their conquests. To most generals such a result would have seemed too glorious to be risked for the chance of still further triumphs. But the conclusion of his address showed that nothing but the destruction of the Austrian army would satisfy him, and to that end he now prepared to cross the Po.

The country north of the Po, through which he had been operating, was a great plain watered by the streams of the Alps, which flow parallel to each other, like ribs, to fall into the great central stream. Flat, and abundantly watered, the country here was marshy, intersected everywhere with dykes, dams, and ditches, and the great roads were on causeways. The cultivated portions were vineyards and mulberry gardens, rendering still more difficult the advance of troops. Such a country is evidently ill adapted for the operations of cavalry, in which the Austrians were very superior. South of the Po, the Apennines, pushed inwards by the Gulf of Genoa, gradually approach the river, till, from Stradella to Piacenza, they form with it a narrow pass. In this pass lay the high road, the Austrian line of retreat from Turin and also from Genoa, for the more direct route from the latter place to Piacenza by the valley of the Bobbio was difficult for the march of any troops except infantry. So long as the Austrians held the places on the left bank, especially the Bridge of Piacenza, they could safely retire on Mantua even in the presence of Napoleon on the other side; but, if he held the bridges and posted himself on the right bank, they must break through him or surrender. Before Moncey's arrival he dared not throw a considerable force across the river, because, had he done so, and the Austrians crossing at Casale and Valenza had marched on the Tesino, he could not recall the force from the right bank in time to oppose them, and they would have broken through his feeble cordon, crushing him, perhaps, in detail as they passed. But, as soon as Moncey joined, he commenced the decisive operation.

The corps of Victor, Lannes, and Murat, 28,000 in all, were thrown at three different points across the Po. But the troops remaining on the left bank, viz. Thurreau's and Chabran's detachments, the force lining the Tesino, the garrisons of Crema and Brescia, and the detachments before Cremona, Pizzighitone, and Arona, numbered 29,000. Thus only

half the Army of Reserve was directed on what was almost certain to be the point of collision. On such a point all the force available should be brought to bear. "No detachments," says Napoleon himself, "on the day of battle." Yet he was now seeking battle and detaching half his army. Thurreau's absence could not be helped, because there was no way from Susa to Milan except by passing the Austrians at Turin: Chabran's force was necessary to cover the line of communication. It was also necessary to blockade the garrison in the castle of Milan, who, if free to issue forth, might have done mischief. Making these deductions then, with some posts to watch the Po between the Sesia and Tesino, there would be a necessary diminution of 11,000. Adding 3,000 more posted at Lodi to check the garrison of Pizzighitone and the attempts of Wukassowitch, there would be 14,000 instead of 29,000 on the left bank; thus 15,000 additional men would have been available for the operation on the right bank, and to move them thither would have been to avoid a great error, for Napoleon ran the risk of losing, in the defeat which his inferiority rendered imminent, all the advantage he had won. This he afterwards acknowledged, but accounted for the false step by saying that he was intoxicated with success, and was determined to gain all or nothing.

His idea in thus dividing his army was to guard against the escape of Melas by the left bank. Should the enemy cross the Po at Casal or Valenza, Napoleon trusted that Moncey, with the 10,000 men immediately available, would defend the line of the Tesino till he could recross with the remainder to his aid. But 50,000 Austrians could certainly in three marches have forced their way by Pavia to Piacenza, and by destroying or guarding the bridges would have prevented him from re-crossing at all. There was, moreover, this circumstance to simplify the operations of the Austrians, that, having already lost their communications with their proper rear, they were not hampered as armies ordinarily are by considerations for preserving them, and had only to break through a line which, from Pavia to Arona, extended about fifty miles, and which thrice ten thousand men would have been wholly inadequate to guard.

Before describing the operations on the left bank, it will be necessary, in order to follow them, to return to Melas.

On the 28th May he burnt the bridge of the Orco, to prevent Lannes from pursuing Haddick. On the 29th he looked for the resumption of operations in that direction, expecting to find the whole French army directed on Turin, when, to his astonishment, he heard that Lannes was moving on Chivasso and the army on Milan. He could still have anticipated them at Placentia or Cremona, and consequently at Mantua. But he was still unwilling to relinquish his chance of taking Genoa, or of passing the Var, which he must do at once if he decided to retreat; besides, that would be to abandon without a blow all his conquests in Italy. Hoping that Wukassowitch would, according to orders, defend the line of the Tesino, he resolved himself to attack the French line of retreat by Vercelli, thus cutting off Lannes from the main body, while Wukassowitch checked Napoleon in front. This movement was actually begun on the 31st, when, for the first time, he heard of Moncey's advance, and the hasty retreat of Wukassowitch behind the Adda.

Awake at last to the perils that enveloped him, he suspended the advance on Vercelli, because, to make an important movement while the enemy threatened his rear, he must first concentrate his forces, or the distant corps might be separated from him and lost. Lannes was thus extricated from what would have been a difficult or ruinous position, and allowed to pursue peaceably his march on Pavia. The orders for assemblement were explicit. Elsnitz was to leave the Var and move by Tenda, Coni, and Asti, on Alessandria. From Nice to Asti is eighty miles—four marches; he might therefore have been on the Bormida on the 5th or 6th of June. The corps about Turin was also, as soon as Elsnitz should be abreast of that place, to move on Asti, leaving a garrison in the citadel to defend it against an enemy from Susa or Chivasso. Ott was to raise the siege of Genoa in the night following the reception of the order, and, leaving a rear-guard to defend the Bochetta pass, was to march by Bobbio on Piacenza. The distance was about fifty miles—and he might, therefore, supposing him to receive the order on the 2nd, have been at Piacenza on the 5th of June. Had he obeyed his orders the Austrian army would have been saved, for, Piacenza being suitably occupied, Napoleon could not cross the Po. But a momentary success prevented the march of Ott—a bait offered by the evil destiny of Austria.

Hitherto the opposing forces on the Var and at Genoa might be left out of the immediate problem of the campaign, because they neutralised each other. But now events at both those points began to complicate the situation. On the 28th of May, while Napoleon was moving towards Milan, Suchet, after repulsing an attack, assumed the offensive. Elsnitz had been originally ordered, in case he should be obliged to fall back, to cover Genoa by taking post behind the Roya. The subsequent orders of the 31st to retire by Tenda had not reached him, and, while he was attempting to carry out his original instructions, Suchet turned his right. The courier coming with the orders by Tenda was therefore obliged to turn about and make a long detour by Ormea, and Elsnitz continued to fall back towards the Ormea pass. Retiring too precipitately, two of his divisions were cut off in the mountains by the French advance, and on the 7th of June he reached Ceva, having lost in that terrible retreat more than half of his eighteen thousand.

Suchet now moved on Genoa, knowing his path was clear. But he received news which stopped him.

Massena, as has been said, had tried to notify Napoleon that he could not hold out beyond the 24th of May. There was already some talk of capitulation on the 26th, when Colonel Franceschi arrived off Genoa with the news that he had seen the French army descend from the St. Bernard. Pursued by an English cruiser, he jumped overboard and swam ashore. The intelligence he brought induced Massena to hold out yet ten days. On the 31st May some overtures were made and received, and on the 2nd June the famine among the troops and inhabitants, who had suffered also two days' bombardment from Keith's fleet, was so dreadful that he promised to treat with Ott if not succoured in 24 hours. Accordingly next day, the 3rd, he sent his Adjutant-general to Ott. The latter had in the meantime received from Melas the news of Napoleon's move-

ment on Milan, and the order to raise the siege; he had also heard, indirectly, of the disaster of Elsnitz. No doubt he felt the urgent necessity of moving at once; and yet to abandon the siege which had cost him so much when the enemy was on the point of surrender seemed too great a sacrifice. He persuaded himself that if Melas had known the enemy's condition the order would not have been given. Massena would have decided the question for him had the news of Napoleon's presence in Italy reached Genoa, but he was ignorant of it, though his envoy it is said actually met the officer who brought the intelligence in Ott's ante-room. A conference was therefore held on the 4th, in which it was agreed that the French should evacuate the place with arms and baggage, 8500 by land, 1500 with Massena by sea to Antibes. Ott placed 10,000 men in Genoa. The French who marched out joined Suchet on the 6th June between Savona and Finale, and that general then pushed his advanced posts to Montenotte.

On the 5th June Gottesheim's division from Ott's force quitted Genoa by Bobbio for Piacenza; on the same day Vogelsang's division marched for Tortona, and on the 6th Ott himself followed with Schellenberg's division. The cavalry of Gottesheim's division march by Tortona.

Although on first hearing of Moncey's march Melas had ordered Kaim and Haddick to unite at Alessandria, yet, as Elsnitz was now coming from Ceva with greatly diminished forces, it was considered indispensable to cover the Alba road, which might else be open to Thurreau's attacks from Susa. Kaim and Haddick were therefore ordered to remain in the camp at Turin till the 8th or 9th.

But on receiving the news of blow after blow—the hasty retreat of Wukassowitch on Mantua and Cremona—the junction of Bonaparte and Moncey—the shattered condition of Elsnitz's corps when it arrived at Ceva—and, finally, the junction of the French troops from Genoa with Suchet, Melas saw how urgent it was to guard against these new dangers by measures of the utmost promptitude. Prince Hohenzollern, the commandant of Genoa, was ordered at once to expel the 1500 French who were still awaiting embarkation, and who refused except by sea to quit the place, where their presence obliged the Austrians to keep a larger garrison than they could spare. The defence was to be intrusted to 3000 Austrians whom Massena had captured, and who were unfitted by the privations of the blockade for service in the field. The rest of the garrison was to march on Piacenza, and Keith was requested to replace it by an English garrison from Minorca. Troops from the line of the Po were to move instantly on Piacenza. Ott's divisions were to be directed by forced marches on that place, and Hohenzollern was to follow three or four days behind. They were to defend the bridge of Piacenza to the last extremity. The rest of the troops, except those in garrison, were to move on Alessandria, where they were expected to unite before the 12th. Some of these orders were probably despatched on the 8th, but on that day Napoleon was across the Po.

On the 6th, Lannes, from Pavia, collecting all the boats he could, was passing the river opposite Belgiojoso. Some Austrian troops marching from about Casal arrived there at the time and attacked the battalions that crossed first, but these held their ground till others crossed to their

support, when the Austrians were driven back, and Lannes' division formed on the 7th with its back to the river, overlooking the Stradella road.

On the 6th, Murat, with the cavalry and one division from Lodi, attacked the *tête-de-pont*, or fortification covering the bridge at Piacenza. This work, which the Austrians had rather neglected because it did not appear of importance in the plan of campaign, had been repaired between the 3rd and 5th, but only 200 men defended it, and the nearest re-inforcement was engaged with Lannes at Stradella. Therefore, hopeless of aid, they abandoned the *tête-de-pont* in the night after repulsing Murat's attack, and crossed the river to Piacenza, destroying the bridge. Thereupon Murat, out of the materials of the broken bridge, made a new one at Nocetto, below Piacenza, and crossed. Duhesme also carried Cremona, and crossed there after Murat.

It was now that scattered parties of the Austrians, making for Piacenza in all haste, began to arrive, but only to find themselves anticipated at the decisive point. First the Austrian general, Oreilly, marching at full speed by the Turin road with some squadrons of cavalry, came up. Besides the unexpected presence of the French, he was further embarrassed by a large park of artillery which followed him, being the reserves of Melas despatched from Alessandria towards Mantua for safety. Oreilly threw two companies of infantry into the castle of Piacenza—probably the former garrison of the *tête-de-pont*—and with his cavalry attacked the French who had crossed at Nocetto. At the same time also, but without concert, the regiment which formed the advanced guard of Gottesheim's division, coming by Bobbio, entered Piacenza. They were driven out by the French, and what remained of them rejoined the division, which wandered about without orders for several days. Oreilly retreated on the road he came by, breaking through the advanced posts of Lannes, and the artillery park was saved for the present, as the conflict in the town gave it time to retrace its steps, and shelter itself in Tortona. Lastly, a regiment of Austrians, coming from Tuscany by Parma, also encountered Murat's division, and was driven back to Firenzuola.

Ott's two remaining divisions were re-united at Novi on the 7th, and continued their movement on Piacenza. He would not believe that the mass of the French army was crossing the Po; he believed it to be moving on Mantua. Why he should suppose that an army, which already held a point on its adversary's communications, should march fifty miles further, when at only one march from that point which it was most important to maintain—viz. the defile of the Po and Apennines from Stradella to Piacenza—does not appear. However, with the idea that he would find before him only a fraction of the French, he crossed the Scrivia on the 8th, camped at Voghera, and pushed his advanced guard to Casteggio, where Oreilly rallied upon it.

Hohenzollern, who was to have joined Ott, remained with his division in Genoa. He refused to leave the place without a second order, because Admiral Keith declared himself unable to bring troops from Minorca without the sanction of their general, Abercrombie, who was on his way from England.

Napoleon was unable to leave Milan till the 8th, though he foresaw an immediate action. He ordered the divisions that had already crossed to concentrate at Stradella, telling them that they would probably be attacked by a force from Genoa, on the 8th or 9th. Lannes was in position before Stradella with 8000 men when Ott advanced; but, instead of being at the mouth of the defile, as Napoleon intended, he was beyond it; his left on the spurs of the Apennines, his centre on the high road towards the village of Casteggio, his right on the flat bank of the Po. On the 9th the Austrians brought on an action, and Lannes, after a stout fight, was giving way, when a division from the rear came up to his support, and the battle, which was most hotly contested about Casteggio, was renewed till the Austrians were broken and retreated to Montebello, losing from 4,000 to 5,000 in this severe action, from which Lannes derived his title of Duke of Montebello. Just at its close Napoleon appeared on the field.

Ott fought at Montebello to drive back the French on the right bank, and recover Piacenza. Lannes fought, though inferior in numbers, because he knew that all the French that had crossed were coming up in his rear; he knew too that, with the river behind him, a retrogade movement might be most disastrous. Ott had about 18,000 men; he saw before him only an inferior force; he was ignorant of the movements in support of Lannes, and his orders to move on Piacenza were positive. Had he known the true state of affairs, his policy of course would have been to join Melas for the final attempt to break through.

Collecting his divisions, and falling back to the mouth of the Stradella pass, Napoleon spent the 10th and 11th in strengthening that position, and increasing his communications across the Po. On the 11th he was joined by Desaix, the most gifted, next to Napoleon, of all the generals ripened by the Revolution. He had lately won a great name in Egypt, and had now come to serve in one last battle under the great soldier whom he reverenced. Napoleon placed him in command of the divisions of Monnier and Boudet.

The position of Stradella, supported on the flanks, strengthened in front, and unsuitable to cavalry, in which the Austrians were greatly superior, was rendered further favourable to Napoleon by numerous farm-houses and villas, which, so strongly built as to be cannon-proof, would diminish the effect of the numerous Austrian artillery. Genoa having fallen (as he had learnt about the 8th), there was now nothing to press his further movements, and his true policy was to await events at Stradella. His part was a defensive one—because the active measures to recover their supplies lay with the Austrians, who, if they remained inactive, would thereby suffer the worst consequences of defeat; viz., utter and hopeless disorganisation. Since they were thus compelled to seek him, he should have taken care that they should find him in a position which assured him of all the chances of victory. But his genius was always active and impatient. He began to doubt whether the Austrians were not escaping by the left bank and the Tesino—he feared, too, that, leaving a force in Alessandria to mask their movements, they might, with greatly superior forces, march to overwhelm Suchet. These considerations, constantly recurring, urged him, on the afternoon of the 12th, to quit Stradella, and to quiet his anxieties by coming face to face with his enemies. They were,

or ought to have been, greatly superior to him in all arms—but his confidence and hardihood led him to believe that their only thought was how to escape him. On the 13th he crossed the Scrivia, below Tortona. An attempt made by Victor to occupy the town under the fire of the citadel failed, and the place was masked by a battalion.

Melas, marching from Turin on the 8th with the divisions of Kaim and Haddick, reached Alessandria on the 10th.

He had three plans to consider: to recover his communications by the left bank of the Po—to force his way by the right bank through the French—to retire on Genoa.

The left bank, as has been said, offers ground far less favourable for cavalry than the right, which may have induced him to set aside that consideration.

The retreat on Genoa offered many advantages. He could hold his ground there against any French force that would be likely to come against him. Keith's squadron would easily provision his army—and in the last resort he could embark, and transport it to Tuscany. But to effect this he must march at once, or Suchet would block the passes of the Apennines.

But to abandon all this conquered territory without a battle seemed too pusillanimous. The French signally defeated might be driven back over the Alps, and all disasters remedied. He resolved therefore to put his fate to the issue of a battle.

Having once resolved on this, his first measure should have been to call in all available detachments. To what purpose should he continue to guard his present flanks and rear, when the best thing that could happen to him would be to find the French behind or on one side of him, instead of across his present front? He had in Alessandria 30,000 troops, of whom 8,000 were cavalry, with 200 guns. At Turin and Coni he had 8000 men; at Casal, Feliciano, and Alessandria, 6600. It was necessary to leave a force in Turin, to prevent Thurreau from coming on his rear—and 2000 would have sufficed for Coni. By drawing the others to him he could have assembled 10,000 more than he had on the day of battle.

Napoleon committed what had nearly been a ruinous fault when he debouched with his inferior cavalry and fewer guns into the great plain of Marengo. To add to the risk, he detached one division of Dessaix's corps towards Rivalta, to guard against Hohenzollern, whom, from false intelligence, he believed to be advancing with the garrison of Genoa by the Novi road. He left Monnier's division of Dessaix's corps at Ponte Carone, and 1600 cavalry at Castel Novo, to maintain the communication with Pavia—and then advanced across the plain of Marengo with the troops that remained, 15,000 infantry, 2000 cavalry, and 40 guns. One reason which caused this imprudence probably was, that the road by which Melas must march to Genoa crossed the plain of Marengo. If then he could throw himself across this road, Melas would be restricted to two of the three alternatives already enumerated.

Having reached San Giuliano without hearing anything of the enemy, he caused the plain to be scoured for news, but none was obtained. But Victor, marching in advance, came at last on the remains of Oreilly's defeated troops in the village of Marengo, attacked and drove them out of

the village back on the Bormida, and even attempted to seize the bridge, but the fire of the batteries of the camp, and the guns of the *tête-de-pont*, caused him to retire towards Marengo.

Judging from the ease with which the Austrians were forced from the village, Napoleon concluded that the main body could not be in Alessandria, or it would have supported so important an outpost. Urged by his doubts, he returned to the Scrivia, on his way to get intelligence from the Po and Tesino; but the river suddenly overflowing prevented him from crossing, and he remained for the night on the bank, at the tower of Garofolo.

That day Melas had held a council of war at Alessandria, the opinion of which was unanimously for attack; and, accordingly, next morning the Austrians filed in three columns over the bridges of the Bormida.

Two roads cross the plain towards Alessandria; one by Tortona and St. Giuliano, by which the French had marched; the other nearer the Po, by Salé, across the Scrivia, to Pavia. On this latter road is a village called Castel Ceriolo, where the French right rested; abreast of it in the plain between the two roads is Marengo, and a muddy rivulet—the Fontanone—runs along the front of the villages, making a loop on the left of Marengo towards the Tanaro. The French line was from Castel Ceriolo on the right, through Marengo, to the Fontanone on the left. The line was held at first by Victor's corps alone, that of Lannes being behind him on the plain; Dessaix was still towards Rivalta, Monnier behind the Scrivia, but both were moving in haste to the field at the urgent summons of Napoleon.

Melas's plan was to direct one column against the French centre at Marengo, another smaller one against their left, while Ott, with 8000 men, turned Castel Ceriolo on their right. He made several mistakes in his arrangements. First, though he had two bridges to file over, he had only one issue from the *tête-de-pont* which covered them; for which reason only one column could pass at a time, and Ott's, which had furthest to march, was the last to issue forth; consequently he was not in position to engage till long after the others. Secondly, as if to compensate for Napoleon's fault of detaching Dessaix, Melas, hearing that Suchet was approaching Acqui, and not considering that, even if it were true, that circumstance could not influence a battle which must be decided in a few hours, detached more than 2000 horse on the Acqui road. Thirdly, it was a grand error under the circumstances to attack the village of Marengo at all. Under ordinary circumstances it could not be neglected—but these were no ordinary circumstances. Melas had no communications to guard; when he issued from Alessandria, it should have been in the firm determination not to retreat upon it—his sole thought should have been how to enter the plain with all his forces, and form front to the enemy in any direction except his present one. His attack on Marengo should have been a feint, and his whole force after making that feint should have followed Ott under cover of his superior artillery upon the Salé road. They would thus have been on the plain, on the flank of the French, and able either to fight or move towards the Po.

However, instead of this, the Austrians engaged in an obstinate and bloody fight along the Fontanone, which, as well as Marengo, proved a

most formidable obstacle. Still, as soon as Ott came up on the French right, they pressed back Victor and Lannes by weight of numbers. Napoleon, at this juncture, appeared with Monnier's division, and for a time restored the battle, but the French were again overmatched, and driven in scattered order across the plain, till their left rested on San Giuliano. Had Melas now possessed his 2000 cavalry in reserve, the French retreat would have become a rout, and Marengo would have been an Austrian triumph. As it was, affairs looked so well for the Austrians, that Melas, worn with fatigue, left the field to despatch intelligence of his victory to Genoa, Turin, and the Aulic Council. The Austrians, committed to Zach, the chief of the staff, were formed in long columns previous to following up their success by a march.

At this moment Dessaix with his fresh troops appeared on the field. It is said that Napoleon thought at first of employing these to cover his retreat; but he presently resolved to use them in a last effort for victory. Supported by the only French guns now serviceable, and by Kellermann's horse, Dessaix formed line in front of San Giuliano; the head of the advancing Austrian column was surprised, enveloped, charged in flank by Kellermann, and finally dispersed. The other columns in rear made valiant attempts to stem the torrent and to deploy on the plain, but the head of every formation was enveloped and destroyed, and at nightfall the whole army lately victorious was flying across the Bormida back to Alessandria.

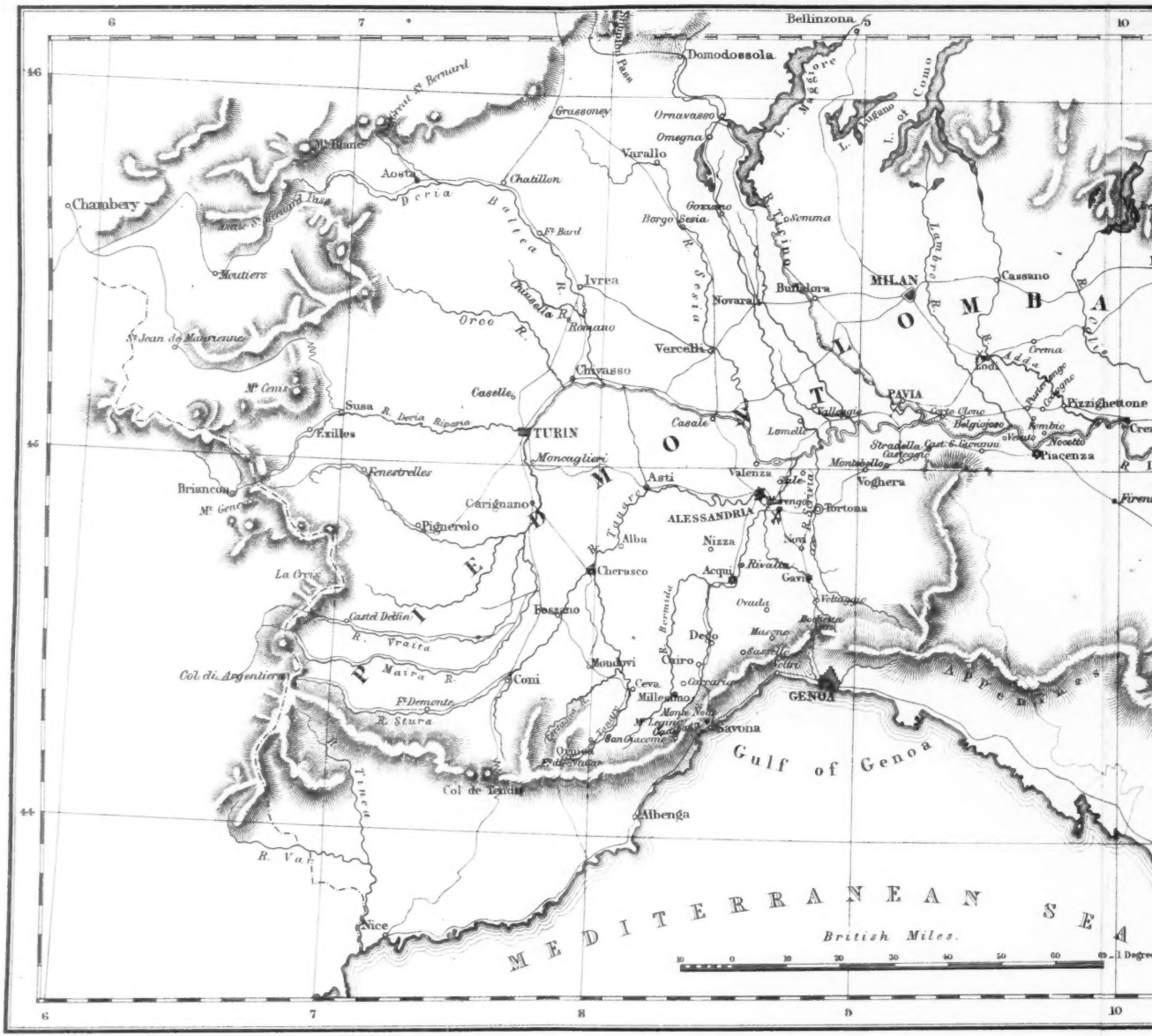
Melas had been puzzled by the near and nearer approach of the cannonade towards Alessandria; but his doubts were soon removed by the fugitives who poured in. The night was spent in trying to restore some order, and in distributing supplies. "Day," as an Austrian journal expressed it, "came to show the sad wreck of a battle won." Melas was still considering how to retrieve the stroke when he learned that his redoubtable adversary had summoned the *tête-de-pont*, and had formed his columns of attack. Under these circumstances, and seeing that his position was further complicated by the advance of Suchet towards Acqui, he made overtures for a convention.

Napoleon on his part was willing to treat. His losses in the battle had been considerable; the Austrians were still formidable and might renew the action; they might escape by the Tesino; they might turn and overwhelm Suchet, and shelter themselves in Genoa; therefore he received the envoy of Melas with consideration, and the convention of Alessandria was concluded.

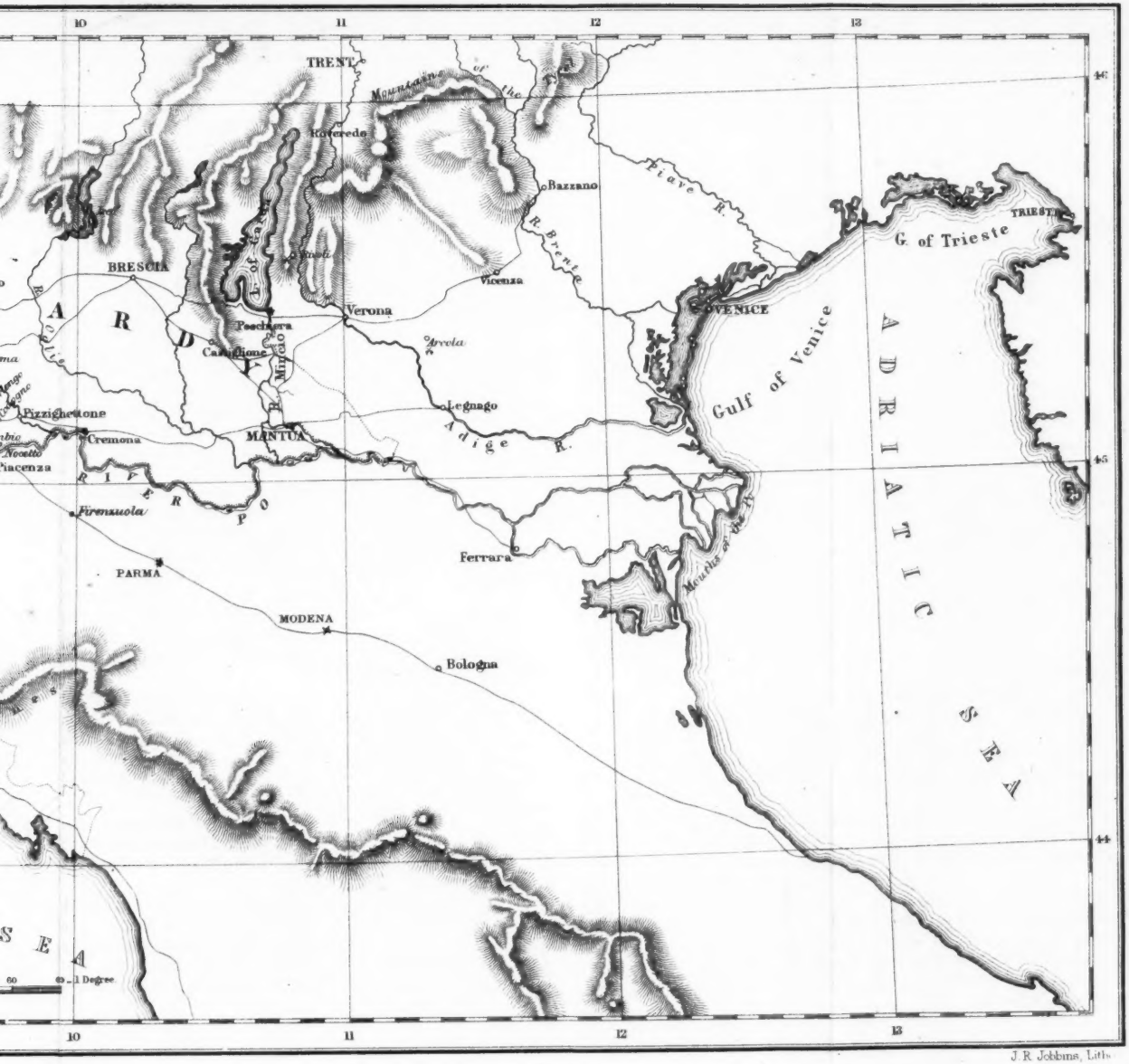
By it the Austrian army was permitted to pass to the Mincio; 60,000 soldiers were thus saved to the empire. In return Melas surrendered all the fortresses and citadels in front of the Mincio up to the frontier and the sea.

The great soldier's dreams of the reconquest of Italy were thus realised in less than four weeks by the unfailing execution of a nearly perfect plan; and the campaign of Marengo remains one of the most wonderful examples of that system of a war of marches, which, originating in the necessities of the French republic, was so constantly and gloriously illustrated by Napoleon.

MAP TO ILLUSTRATE THE FRENCH CA



ENCH CAMPAIGNS IN ITALY IN 1796 & IN 1800.



J. R. Jobbins, Lith.

Friday, March 16th, 1860.

The Right Honourable The EARL of ELLENBOROUGH, G.C.B., in the Chair.

ON THE NECESSITY, DESCRIPTION, ORGANISATION, AND COST OF NATIONAL DEFENSIVE MEASURES.

By Lt.-Col. JOHN PITT KENNEDY, formerly an Officer of the R.E., Military Secretary to the late General Sir C. Napier when Commander-in-Chief in India, &c.

1. THE Defence of the Empire embraces the protection—

First. Of Great Britain and Ireland;
Second. Of British Colonies throughout the world;
Third. Of British and Colonial Commerce on the High Seas.

2. These important interests must be protected not only against the possible aggression of the most powerful states single-handed, but likewise against the combinations of such states taken collectively.

3. We may fairly reason on what may be attempted in future from what has actually been done in times past.

England was conquered by the landing of foreign forces on her shores.

In later times the military resources of the first Napoleon enabled him to provoke, and, with 180,000 men, for years to maintain, a conflict against England, Spain, and Portugal, and simultaneously to launch a million of men against the Russian Empire, whilst, having beaten Austria into temporary servility, he kept Prussia in a state of perpetual castigation; and although from his having undertaken too much at a time, from England's preponderating naval force in those days, from the tenacious resistance of British sailors and soldiers in every conflict, finally, from the combination of the very elements against him in Russia, his ruin was effected, it is not difficult to imagine how different might have been the results had he conciliated Russia, until, by concentrating and personally directing his vast resources against the Peninsula, he had settled the Spanish question, and had he above all succeeded in making his Navy equal to that of England, which latter appears to be a cherished policy of the reigning Emperor.

4. Neither is it difficult in the present day to conceive a French and Russian alliance for aggressive objects against England, thus opposing to her two absolute monarchs sustained by nearly a million and a half of first-rate soldiers, with large and increasing navies, and having the entire resources of their respective empires at their individual control.

5. Against these and all other combinations defensive measures must be effectually calculated. When the interruption of peace and industry depends upon the will of individual men representing half a million or a

million of well-trained warriors, their neighbours are bound to adopt the requisite precautions in due time.

6. The passage of the Pruth is but five years past. It was the headstrong act of one man. It lighted the torch of war, and extinguished a large amount of the commercial and industrial energy of the world, and particularly of England, from that day to the present time.

7. The still more recent passage of the Ticino was likewise the act of another individual leader of armies.

Fortunately both those aggressors were defeated in the conflicts they provoked, but no such penalties could atone for the wide-spread evils which their acts entailed. The precautions and attitude of peace-loving nations should be such *as to control the occurrence of war*, not merely to secure victory when attacked.

8. Up to the passage of the Pruth forty years of tranquillity had led England to imagine that improved political axioms had extinguished for ever her European wars, and, notwithstanding the recent proofs to the contrary, there are still those who venture to assert that the necessity for defensive measures is but a nightmare of weak minds.

As long as absolute rulers find themselves at the head of vast armed masses effectual preventatives must be established on a commensurate scale by their neighbours, and those nations that neglect the required precautions will sooner or later pay the forfeit of their improvidence.

9. The Duke of Wellington, scanning the effects of steam years ago, urged the necessity of national defensive measures. His was not the vision of a disordered or timid brain, but the calculation of the most capable mind that England has ever produced to deal with such a subject, on data derived from the most extensive practical experience. His admonition was neglected on the falsest principles of both policy and finance, and, whatever may have been the amount *of absolute aggressive peril which the country* has *since gone through with impunity*, there can be no doubt that the industrial and commercial injuries sustained by the neglect of his advice, *in the periodical commercial panics* which that neglect has produced, would have paid manifold the cost of any rational defensive system that could have been adopted.

What reasonable sacrifice in the way of national defence could be compared to the withholding of British capitalists' investments for the employment of the people and the development of home and colonial wealth and industry ?

10. It may then be assumed that the power of both internal and external defence must be effectually established, cost what it may, and that the only question is, Upon what principle can it be most effectually and safely established ?

11. This question involves the consideration of both our land and sea forces, their respective amounts compared with those of other countries, and the due application of each to its peculiar duties.

12. It is clear that British commerce on the high seas, which is the very breath of our nostrils, as it sustains the existence and progress of 206 millions of British subjects, can only be protected by the Navy.

That in like manner the British colonies spread over the globe must be mainly protected by the same force, and that the magnitude of these two

interests compared with those of any other nation, or of all other European nations put together, gives not only the right but the obligation to maintain a British naval force, which, whatever its strength, can excite no rational jealousy or suspicion on the part of other countries. The only limit to that force must be the prudential one, affecting ourselves alone, of what it may cost.

13. Great Britain, however, has a just right to look with distrust on, and narrowly to scan the motives of, any large naval increase in other states beyond what their own national requirements demand. This is the true scale by which the amount both of land and sea force in every state ought to be calculated, throwing out altogether the element which confers the power of foreign aggression.

14. Land and sea forces on a legitimate system should come down to the simple scale of a military police. They can only be forced beyond this, in states pacifically disposed, by the existence, as in Europe, of the aggressive scale adopted by some arbitrary neighbouring states; and where that scale exists, even in an individual case, other states, however pacifically disposed, must necessarily raise their own armaments to this standard, or place themselves in extreme peril.

15. To the European standard then by some means England must come, if she is to enjoy security, peace, and *free industrial action*.

It has been shown that under the present state of things British colonies, amounting to 2½ times the area of Europe, with nearly as large a population, and British commerce, must be mainly protected by the Navy.

The first line of defence for the home empire must likewise be the British Navy; and yet it would appear that, after two unexampled years of activity in strengthening our fleet, it is still far below its proper comparative amount.

16. The relative scales of population and commercial activity existing under the protection of the respective flags would justify a British naval force more than fivefold that of France and threefold that of Russia, or twice their aggregate amount, and these considerations not only justify but demand that England should maintain, if not double the amount, at least a large preponderating naval force beyond the combined fleets of those two nations.

17. The administrative duties of the British Government to its widely-spread population justify a land force equal to twice the aggregate force of France and Russia; yet the actual amount of British troops of the Line is under one-fifth of the united forces of those two states, or one-tenth of what the comparison with them would justify! And it must not be forgotten that the 53 nations existing under the protection of the Sovereign of England are scattered through every part of the world, requiring that the British forces should be broken into a corresponding number of detachments, thus justifying a much larger comparative aggregate of force than where the subjects to be protected are concentrated, as they are in other states. Where, then, is the motive to be found for these disproportionate armaments of our neighbours, at least as regards their navies? This is a question which every statesman, nay, every English man, is bound to solve.

18. The Emperor of the French, with all his sagacity, would never

embarrass his finances to create an enormous navy merely as a yacht fleet.

That fleet is unquestionably composed of ships of war, built for some purpose of war, and the world cannot present him with any other antagonist than England against whom such a fleet as he has built could be required to act.

It is clear, then, upon every ground, that the naval preponderance of England must be restored, cost what it may.

19. The shortest and best mode by which this international adjustment of naval forces could be restored, would be by the French Emperor voluntarily handing over such a portion of his fleet, *at cost price*, as would effect the result. It would, in fact, be the soundest financial and political act of his reign, practically confirming his declaration "L' Empire c'est la paix." Nor would it in any way affect the ultimate relative proportions of the respective navies, as otherwise England must accomplish the required result by building and expenditure. It is entirely a financial question, involving equally the interests of both nations.

20. A strong Home Fleet must undoubtedly be the first line of defence for the British Islands.

But to make the Navy the only defence, or even the principal defence, as regards England, would cripple the Government in the employment of its naval forces, and would either leave the distant possessions of the empire unprotected, or would require so preposterous an expenditure as must revolt the mind of any reflecting man, and still leave us insecure.

England, the focus of the Empire—the source from which investments extend to the vast British Colonies, and the consequent mainspring of their development; the cradle and asylum of civil and religious liberty throughout the globe; the most detested object of arbitrary power; the chief emporium of the world's wealth; the most tempting military booty—hence, the most inviting point of attack, but the most worthy and most easy of defence! What, then, is to be the principal permanent defence of England?

21. The estimates of the Army and Navy for the current year 1860-61 must be considered in reference to this question:—

Army	£14,842,275
Navy	12,802,200
Total Army and Navy .	£27,644,475

Of this very much increased amount as compared with former years, a considerable portion is to supply some of those lamentable deficiencies which had been permitted through views of mistaken economy to reach a point perilous to the security of the nation, and which are now being gradually remedied. Here, then, we have—

One year's estimate of military establishments .	£27,644,475
Added to an annual charge for former wars of about	28,000,000
Making a total of	£55,644,475

or about five-sixths of the entire state revenue, applied to the payment for past and present military establishments.

This includes, it is true, the charge for those 20,000,000*l.* which were expended to erase the stain of slavery from the flag of England.

Such an amount of military expenditure is no doubt most lamentable, though far preferable to the alternative of becoming a province of the French empire! This must be our consolation for past incumbrances, as well as the stimulus for future defensive preparations.

22. The Navy Estimates provide a force of 54,000 men of all ranks for the fleet, in addition to the Coast Guard and the crews of training, surveying, troop, and store ships. The average cost per man of all ranks appears to be about 60*l.* per annum. The estimates likewise provide a force of 18,000 marines of all ranks, at an average cost of 49*l.* each per annum. But the most important feature of these estimates is the determination evinced—

1st. To strengthen our naval position by the *required* numerical increase of steam ships of war.

2nd. To establish a certain rapid means of manning the fleets of England.

23. All honour to the existing Government for their efforts to restore to its right relative standard the true characteristic force of the British Empire. Honour, too, to their immediate predecessors, who effected so much in the same direction, and in so short a time. How earnestly must that course still be pursued, when we find that the French steam navy is far beyond its proper relative strength, and is daily adding to that strength; that the Russian navy is making a similar progress; that the French and Russian navies can with safety be dismantled, because their shores are amply protected without them, and they can be re-commissioned with *facility*, certainty, and rapidity, whilst, if the British fleets be reduced, they can only be manned with difficulty, uncertainty, and delay; finally, that the French and Russians are still rapidly building new ships of war!

24. How is this destructive competition to end, and what is its object?

If continued, the result must be financial ruin to the weakest treasury, and great injury to all.

Its sole and unmistakeable object is hostility to the naval position of England, a position which England cannot compromise or risk whilst she has a man or a shilling left for its reinforcement and security. The destruction of the British fleet would be but the first step to the dismemberment of the British empire.

The Admiralty are frequently catechised as to where their ship-building is to have a limit. This question can only be answered by the Emperors of France and Russia.

25. The cessation of our naval competition rests entirely with Russia and France. Even were they to cease building, England must continue until she has her proper relative amount of ships; and, though France and Russia may dismantle their fleets, England must keep hers in commission, until she has actually established as certain and rapid a mode of re-manning those ships as that adopted by either France or Russia; when so situated, and not sooner, England can venture to reduce her fleet if others will do the same.

26. Hence, the effectual mode of securing moderate Navy Estimates,

together with national safety, in future years, must rest upon the measure intended to provide a copious reserve force of seamen; until that great fact is fully achieved, he will be a hazardous statesman who shall venture to reduce the fleet of England below a full war establishment, equal to cope with all that may be arrayed against it.

The start of a few months in completing 30 sail-of-the-line, or other preponderating force, for sea, after a mutual disarmament, would give to the first out an incalculable power of conquest and destruction.

27. The French are stated to have a reserve force of seamen amounting to 90,000 men. This would appear to be an incredibly large number—be that as it may, England should have a certain reserve force *equal to the difference between her lowest peace establishment and the complement required to man every effective ship in the navy.*

28. We may assume, for the sake of illustration, that this reserve complement would reach to 60,000 men, costing annually a retaining payment of 6*l.*, 7*l.*, 8*l.*, or even 10*l.* each as compared with the same number afloat, costing 60*l.* each per annum.

60,000 reserves	at 6*l.*	would amount	to per annum	360,000*l.*
„	at 7*l.*	„	„	420,000*l.*
„	at 8*l.*	„	„	480,000*l.*
„	at 10*l.*	„	„	600,000*l.*

60,000 afloat at 60*l.* each, would amount to 3,600,000*l.* per annum. Thus the saving that would attend a reserve establishment receiving the high retaining salary of 10*l.* would on this comparison be 3,000,000*l.* annually.

In fact the establishment of a certain sufficient reserve force of seamen is the only principle which can justify any safe reduction of importance in the fleet during even the most profound peace as compared with a full war establishment.

29. Those who look back with confidence to British naval triumphs in former wars, as the index of what may still be achieved, must recollect that the transition from sailing-vessels to steamers destroyed the numerical superiority of our ships, which an improvident administration of affairs delayed to restore, and that the suppression of the arbitrary press-gang system, which formerly manned our ships with rapidity, was not followed by any certain mode of supply. The reserve principle recently suggested has not yet proved successful: *additional inducements*, however, must make it so.

30. The objects of a general defensive system for England must be—

1st. To be able to man as large a fleet with as much rapidity as any combination of hostile states can bring against us.

2nd. To leave the great mass of the navy disposable, if required, for the protection of commerce and the colonies, reserving only a strong channel fleet as a first line of defence for Great Britain and Ireland.

3rd. To establish so overwhelming an internal organisation of land forces as shall render the home empire perfectly secure against external aggression, *even in the absence of the channel fleet.*

4th. To accomplish these results effectually at the smallest possible cost.

31. The army estimates provide a line force of 143,362 men of all

ranks, with 14,632 horses charged to the British revenue, and 92,490 men with 9,710 horses charged to the Indian revenue.

Thus the effective British troops of the line amount to 235,852 men of all ranks, including artillery, engineers, cavalry and infantry, of whom 92,490 are for service in India, nearly 50,000 are detached to other colonies, and over 90,000 remain in Great Britain and Ireland. The average annual cost of British troops of the line of all arms and ranks appears to be about 63*l.* per man, exclusive of non-effective charges.

32. The presence of 90,000 troops of the line within the home empire is a consideration well calculated to remove alarm; rarely have the numbers of any British force, opposed to their foes in fight, approached one-third of that amount, and the marvellous power of conveying troops in Great Britain could effect the concentration of these 90,000 men upon any given point inviting an attack, within a few hours. Then why misgivings? The simple answer is, that the regular troops in England are but the fluctuating balance of the colonial garrisons, liable at an hour's notice to be called, as lately they were, to the most distant regions of the earth. In this extended empire, the possibility of such contingencies must ever be kept in view, and provided against.

33. Those whose fiat turns peace into war do not measure our troops by their prowess, but by their limited numbers as compared with their own vast masses; they do not look back to the unequal conflicts through which British troops have carried their country in triumph; and there is no question that the steady industrial progress of the people of England can only be secured by making it quite palpable that not only in quality, but in numbers, are their defenders most formidable. If those numbers can be arrayed without any considerable cost, and without diverting any class from the productive pursuits of industry, this difficult problem will have been solved.

34. A large increase of the regular army would not meet these conditions; neither would the militia principle, nor any other which involves payment for the service given.

35. The principle which does appear applicable, is a well-organised volunteer force, meaning an association of loyal men, so strongly attached to the institutions of the country as gratuitously to form themselves into a well-organised military force for internal defence, and to effect this with such hearty good will and perseverance as shall enable them to prefer the regular indispensable training which it will entail *to the usual recreations that fill up the leisure hours of industrious men.* Such is the high characteristic of the movement which is now exhibiting itself throughout Great Britain.

36. The difference between the militia principle and that of the volunteer is remarkable in several respects. The militia soldier must be paid by the State whilst embodied for training, because during that time he must neglect his ordinary means of livelihood, risking his power of resuming it when the training ceases, and, when disembodied, he neglects his practice as a soldier until he is again called out.

The volunteer costs, comparatively, nothing as a soldier, because his productive time for earning a livelihood is not interfered with, neither is his training or practice as a soldier interrupted, for he devotes to it

daily and weekly only his spare time, instead of following some other recreation. His military pastime injures neither his employer nor himself. The militia soldier ceases during his training to invest his industry in producing wealth; the volunteer continues as usual his productive industry.

37. On the other hand, unless the volunteer force be thoroughly organised, sufficiently numerous, and rightly distributed, its effect must be rather inimical than advantageous; it would lull the nation into imaginary security, whilst neighbouring rulers would be perfectly cognisant of its shortcomings.

A limited number of skirmishers would be a mere delusion ; volunteers, to be effectual as a reinforcement to our regular troops, must be organised in battalions and brigades. They must be able to act in solid bodies, and to meet in line the best foreign troops.

38. The total male population capable of bearing arms in Great Britain may be estimated at about 5,000,000, of whom one-tenth would more than supply the demand for the navy, coast guard, marines, troops of the line, and militia, and one-tenth more would give an effective volunteer force of 500,000 men. The latter would not in any way be withdrawn from the productive industry of the country.

39. The most important element in a general volunteer organisation for Great Britain must be a proper selection of territorial districts and sub-districts, that shall be suited to the assembling for exercise of the different sized squads or bodies of men which constitute an organised force : viz.

One section of 25 men.
One subdivision of two sections, or 50 men.
One company of four sections, or 100 men.
One battalion of 10 companies, or 1,000 men.
One brigade of several battalions.
One division of several brigades.
One corps d'armée of several divisions.

40. The census registration districts offer the best existing arrangement in this respect, giving, as they do, the details both as to area and population of great divisions, counties, districts, and sub-districts, thoroughly ascertained, and classified on a principle quite analogous to what would be requisite for a methodised volunteer organisation for objects of national defence.

41. At the same time, the density of population in reference to area is so very variable in different localities as to require much forethought in adapting the proper details to the circumstances of every case.

The average population of town districts in Great Britain per square mile is . .	3,337
That of country districts	120

Thus, on the assumption that 1 in 40 of the population, or 1 in 10 of adult males, would give a sufficient effective force of volunteers (say 500,000 men), one average mile of town district would produce 83 volunteers, whilst a like extent of average country district would produce but three.

42. Averages, however, give but vague, and often misleading, notions. Of 624 census districts of the third class, comprised in England and Wales, and containing an average area of about 90 square miles each, with an average population of about 28,730 souls, the most dense town district (No. 17, East London) contains a population of 185,751 to the square mile, whilst the least dense country district (No. 557, Bellingham, in Northumberland) contains but 18 souls to the square mile ; and there is every intermediate variety of density per square mile between these two wide extremes.

43. In the district of maximum density, a single square mile would produce on the scale here proposed 4,643 volunteers, or a formidable brigade, whilst, in the district of minimum density, above 200 square miles, or a space 14 miles long by 14 miles wide, would be required to produce a single company of 100 men. In the former case of a dense town district, the volunteers forming a battalion of 1,000 men would be as convenient to a well-selected centre for training drill as a regiment of the line when in barracks.

In the latter case of a thinly, but uniformly, peopled country district, the drill centre for a single company of only 100 men would give a mean distance of nearly five miles for the volunteers to arrive at their assembling point, and the same distance to return after a drill of (say) two hours. This would be an impracticable task to impose for a continuance upon men in the evening, after an ordinary day's work, which would be their only available time for training.

44. In purely country districts, therefore, the drill squad would probably be one section of 25 men, or one-fourth of a company, which, assuming the full proportion of the volunteers, would rarely require more than one mile for any one to reach his drill centre.

45. Of the population of Great Britain, about one-half resides in town districts offering every facility for their assembling in considerable masses, say regiments of 1,000 men, for drill; one-half resides in country districts, where, for the reasons assigned, the drill squad must necessarily be small, as sections of 25 men, sub-divisons of 50 men, and, probably, companies of 100 men each, in the densest localities.

46. The Table No. 1 gives the principal census organisation of England and Wales in 11 grand divisions, subordinate to which there is the requisite classification of five progressive degrees of sub-districts.

47. The map shows how completely this arrangement can be made subservient to a military defence of the country by volunteer corps in support of the regular troops.

48. The proportional force of each grand division, referring to a total force of 500,000, would naturally be enrolled with reference to the strategical importance of each locality. In some districts one-twentieth of the adult males would be a sufficient force, whilst in others four times that ratio might be desirable.

49. In the First great military Division, London, comprising the town portions of Middlesex, Surrey, and Kent, an enrolment of one-fifth of the adult males would furnish a force of 118,000 men.

50. The Second, or South-Eastern, Division is equally important, and should have the same proportion, one-fifth; it would comprise the rural

portions of Surrey and Kent, with the counties of Sussex, Hants, and Berks, and would give a force of over 81,000 men. Head-quarters, Portsmouth.

51. The Third, or South Midland, Division would comprise the country portions of Middlesex, with Hertfordshire, Berks, Oxfordshire, Northamptonshire, Huntingdonshire, Bedfordshire, and Cambridgeshire, and, assuming an enrolment of three-twentieths of adult males, would furnish a force of 46,000 men. Head-quarters, Bedford.

52. The Fourth, or Eastern, Division would contain Essex, Suffolk, and Norfolk, and, giving three-twentieths of adult males, would furnish a force of 41,000 men. Head-quarters, Bury St. Edmund's.

53. The aggregate of the forces of these first four divisions would produce 286,000 men, available against any enemy attempting to reach the metropolis. It would include the defence of the arsenal and various dockyards on the Thames, and the approach to London by that river, the dockyard of Portsmouth, &c.

54. The Fifth great Division, or South-Western, would comprise Wiltshire, Dorsetshire, Devonshire, Cornwall, and Somersetshire. It embraces a considerable portion of the south coast, and should be estimated at the highest rate of enrolment, or one-fifth, which would furnish 90,000 men. Head-quarters, Plymouth.

55. Viewing the paramount importance of the foregoing five divisions, we have estimated as above the aggregate number of 376,000 men for their local defence. They comprehend, in fact, the most important portion of the empire, and that at once most inviting and most open to attack, which, if well secured, will go far towards protecting the whole.

It must be kept in mind, too, that a volunteer system of defence should be based upon the employment of the forces as near as possible to their own localities.

Thus the districts calculated to provoke or invite attack should have within themselves a much larger proportion of volunteers than the others; a proportion of one-twentieth of their adult males might probably suffice for nearly all the remaining divisions of Great Britain.

56. The Sixth Division would be the West Midland, containing Gloucestershire, Herefordshire, Shropshire, Staffordshire, Worcestershire, and Warwickshire, which, taking one-twentieth of the adult males, would muster 26,000 men as a central reserve, ready to support any point attacked. Head-quarters, Birmingham.

57. The Seventh, or North Midland, Division, comprising Leicestershire, Rutlandshire, Lincolnshire, Nottinghamshire, and Derbyshire, on the same scale of one-twentieth, would give 15,000—Head-quarters, Grantham—and would likewise be a disposable reserve.

58. The Eighth, or North-Western, Division would be Cheshire and Lancashire, which, enrolling one-twentieth, would muster 31,000 men. Head-quarters, Manchester.

59. The Ninth, or York, Division. The three ridings of Yorkshire, at one-twentieth, would furnish 22,000. Head-quarters, York.

60. The Tenth, or Northern, Division: Durham, Northumberland, Cumberland, and Westmoreland, at one-twentieth, would give 12,000 men. Head-quarters, Carlisle.

61. The Eleventh, or Welsh, Division: Monmouthshire, with North and South Wales, at one-twentieth, would give 15,000 men.

62. The Twelfth, and last, Division would comprise the northern and southern counties of Scotland, mustering, at one-twentieth, 36,000 men, with head-quarters at Stirling.

63. The result of thus regulating the enrolment of volunteers would be to give a total volunteer force of about 535,000 men in Great Britain, of whom about 376,000, or over two-thirds of the entire, would be concentrated within those districts most exposed, and most inviting to any hostile attack. It will be a somewhat difficult, and a very important, matter, thus to regulate the formation of corps by stimulating their enrolment only in the ratio of the relative importance of their presence in the respective districts.

64. There is now a distinct course of action to be selected out of several that suggest themselves—

1st. Matters may go on as formerly, without any preparation whatever, accompanied from time to time, as hitherto, by discreditable acknowledgments of weakness, and followed by wasteful commercial panics, until the irremediable disaster which such a course invites and merits shall occur; or,

2nd. The regular line forces may be increased, and costly fortresses may be erected, until our means of resistance shall have become superior to any possible aggressive combination against us; but the consequence of such a course must be financial ruin, with other serious objections; or,

3rd. The present high national feeling may be fostered and wisely directed, until the volunteer force reaches those dimensions, and that efficiency in the precise districts calling for it, which, at small cost, shall reinforce the regular troops, and render the home empire perfectly secure, both from real danger and commercial panics.

65. Thus far the 12 principal divisions of Great Britain have been dealt with, as suited to an army organisation, in reference to the requirements of command, and the power of local inspection.

66. It is desirable to offer some more intelligible estimate as to how this territorial arrangement would tend to promote enrolment and practical organisation by the adoption of such small districts as would come within the personal knowledge and influence for good of every man in Great Britain.

This will be found in the 12 Tables of subordinate districts, which form sub-multiples not only of the great military divisions already referred to, but likewise of the counties composing those great divisions; thus retaining the indispensable co-operation of the existing county authorities under the respective lords lieutenant.

From these 12 Tables, which exhibit England and Wales in 624 districts, and Scotland in 72 districts, every man can find the locality with which he is intimately acquainted, and wherein, knowing what is expected of it, he would naturally promote by his labour and influence the great public object in which his personal interests are so deeply involved.

67. The Tables will show the number of males capable of bearing arms in each district; the average number of effective volunteers which the population would produce on the scale of one in 20, one in 10, or one in 5,

of males capable of bearing arms; they likewise contain a column to show the proper establishment of volunteers that should be enrolled in reference to the strategic importance of each division with a view to its efficient defence.

68. Assuming that the enrolment of effective volunteers may reach the estimate suggested for Great Britain, or about 500,000 men, the proportions of cavalry and field artillery suitable may be taken at two squadrons of 100 men each, and a field battery of six guns, to every brigade of three battalions of infantry, 500,000 volunteers would thus produce of

Infantry, 450 battalions of 1,000 men each;
Cavalry, 300 squadrons of 100 sabres each;
Artillery, 150 field batteries of six guns.

There can be no more difficulty or cost for those who already keep horses for objects of enjoyment, or even industry, to enrol themselves for the artillery or cavalry, than for those who do not keep horses to enrol themselves for the infantry.

69. Of the hundreds of English pastime clubs, from the horse-race to the cricket, the yacht down to the skittle, there is none that can give more excitement and amusement than the meets for training and practice of artillery, cavalry, and infantry corps.

70. It will be indispensable to the success of an efficient artillery, that the Government should be prepared to furnish the best description of guns and carriages for field batteries, where volunteers are found to provide the horses, gunners, and drivers.

71. The present volunteer movement is indeed a grand exhibition of wisdom, energy, and patriotism; and so long as such a national spirit exists, and is wisely directed, England can have nothing to apprehend. But, to produce its effect, it must be wisely directed. Like all first efforts, it must have its incidental errors.

72. One of the most general rules for enrolment is, that each volunteer should pay an entrance fee and an annual subscription, besides giving his time and exertions gratuitously, and meeting the expenses of his uniform.

The result of this rule in my own district is, that, whereas our proportion of an aggregate force of 500,000 men should be over 1,300, we have as yet enrolled less than one-tenth of that number.

The subscription principle would, in fact, exclude the working classes, and thus render the whole undertaking a failure. It is therefore essential that this rule should be erased, and that every good man who has the spirit to join for the common defence shall be received without either entrance fee or annual subscription, otherwise the required numerical force cannot be obtained.

73. In opening the volunteer corps to every class in Great Britain, it would be very wrong to overlook the qualification of unblemished character. This point should be especially secured, because the maintenance of discipline and good conduct cannot be so strictly enforced by "Articles of War" as in a regular army.

74. Whilst the most general rule now is to charge entrance fees and annual subscriptions, aid is in some districts given towards the supply of

uniforms. This would appear to be an error in the opposite direction. The uniform ought to be an inexpensive and neatly cut dress, such as would not exceed the cost of a mechanic's holiday suit. It might, therefore, be furnished by himself. The money subscription, as a rule, he cannot and will not pay.

If one-tenth of the ablebodied men devote their *spare* time and trouble gratuitously to the service of the State, it is not too much to expect that the remaining nine-tenths should furnish the small amount of money required for the general objects of organisation, if the Government itself should hesitate to do so.

75. An economical administration would probably keep the annual expenditure of a general character within 2*l.* per man enrolled, making, at the largest rate, the cost for 500,000 men 1,000,000*l.* per annum; and 2*l.* per man who serves, levied upon those who do not serve, would be but a nominal rating. In practice, the rich classes in this country would probably, as is usual, take such a contribution voluntarily upon themselves. Better still would be the principle of rendering it *quite certain*, by making it a public charge. Its effect would probably be to reduce, by many times its own amount, what must otherwise be the future taxation of the country.

It would be, in fact, the best and most provident national insurance ever effected against disaster and risk, and it would produce its annual bonus in the shape of reduced taxation.

76. The organisation being in battalions, and the drill centres regulated by the density of the population, either for an entire battalion, a wing, a company, a subdivision, or a section, in order to facilitate the regular attendance of the volunteers, by securing that the drill centres shall be as close as possible to their respective homes, the lieutenant-colonel of each battalion should have an adjutant and sergeant-major, both thoroughly trained soldiers. He should, with their assistance, train his officers. After the first week of such training, the officers would be sufficiently advanced to meet their respective companies in the evening, and communicate the first lessons they themselves had acquired to the men, and so go on progressively, until all were perfect. Where the battalion could assemble at one point there would be every facility for perfect training. Where the companies have separate drill grounds the adjutant should have training charge of the companies of one wing, the sergeant-major those of the other wing; each attending alternately the companies under his instruction at their evening drills to assist the company officers.

77. There has been much cost and inconvenience incurred, in consequence of the enrolment and drill having commenced at the wrong season, winter; rooms have been hired at heavy rents, and drill-sergeants paid to instruct only a few men. In the spring and summer all those inconveniences will vanish. The long evenings and fine weather will admit of drill parades in the open air, after the usual working hours of artizans, &c. The Saturday half-holiday, now so general, will facilitate much the training. It will enable the battalions to unite their companies, and turn out for a field-day once a week; and, in dense districts, to meet for brigade drill once a month, three or more battalions together.

78. The enrolment of volunteers demanded as a preliminary the appoint-

ment of a responsible officer, charged with the organisation and inspection of the entire force.

That appointment has just been conferred upon an officer admirably suited, by his past experience, for the task confided to him.

His military rank, however, should be increased, to give his opinions and advice due weight.

The counsel of a general officer would be received with respect, when his inferior in rank might be little heeded.

79. The tendency to introduce varieties, by way of "improvements," in different corps, will be strong in proportion to the inexperience of the parties seeking to make such innovations; and these can only be counteracted by judicious and patient perseverance on the part of the responsible inspecting general, who will necessarily require a local deputy inspector of sound discretion and military experience in charge of each of the 12 great military divisions.

This principle of inspection, sustained by the presence of an adjutant and sergeant-major on permanent duty with each battalion of infantry, each regiment of cavalry, and each field-battery of artillery, will produce a well-organised and efficient force. But without at least this proportion of officers, bound to devote their entire time to produce unity of action, and the observance of certain fixed military principles, it would be idle to expect any result of a permanent or useful character, notwithstanding the high motives and vigorous spirit by which this great national effort has been thus far so universally distinguished.

80. The power of concentrating troops upon any point is probably more perfect in Great Britain than in any other country in the world.

Taking London as the principal base of operations and the principal point of defence, our communications cannot be cut off. The worst that can happen is, that we should be attacked at some outpost, which at the shortest possible notice can be fully reinforced by any desired proportion of our entire forces.

Assume that six trains can convey a brigade of 3,000 men on a well-graded line furnished with perfect machinery;

That trains can follow each other, as they frequently do, at intervals of a quarter of an hour;

This will enable 3,000 men to be started along each railway going towards any given point every hour and a half, or in 12 hours 36,000 men, and in 24 hours 72,000 men by only one line of railway; and if there be two lines of railway converging to the point of concentration these numbers would be doubled, if three they would be trebled, &c.

As there are ten lines converging at London which ramify a little way from London into about twice the number, these could pour in their reinforcements at the rate of 20,000 men an hour.

Several points on the South Coast have two, some three, converging lines, and nearly every point is approached to within five miles by at least one line of railway. Thus the minimum power of concentration upon any point of that important district would be about 48,000 men in 24 hours, and the power to approach some of the most interesting points, as Portsmouth for example, would be thrice that ratio.

The power of concentration is perfect, and the whole question of defence

is confined to that of whether the troops themselves shall exist in sufficient numbers within the limits of the home empire.

81. Startling projects are whispered of costly fortresses, involving an expenditure of 10,000,000*l.* or 20,000,000*l.* England is precisely the country where fortresses would be least applicable. They would lock up our valuable but too scanty troops, who would be required to operate actively in the field against their foe, wherever he may present himself; and lamentable indeed will be our case if we ever give an enemy time to sit down before a British fortress.

82. The only fortresses we require are floating fortresses, and of those we cannot have too many. The cost of one fortress on shore, which would do more harm than good, would provide several additional ships of war, capable of adding their ubiquitous protection to the flag of England wherever it is hoisted, from our Sovereign's palace to the uttermost ends of the earth. We may indeed require on shore a few very powerful batteries, closed at the gorge, to defend certain approaches to harbours, &c. but this should be the extent of our preparation of that class. Then, with our preponderating ships of war, and a well-equipped field force, sufficiently numerous, well organised, and well commanded, to fulfil its important charge, we shall have nothing to apprehend.

83. Where is the commander to be found who would hazard to attack a better fleet than his own, for the purpose of landing an army on a shore protected by a nation of well-organised, well-commanded, and stout-hearted soldiers, more brave, better equipped, and far out-numbering the invaders? *These are the elements to be established for England's defence*, and not fortresses, which would keep no invader off if our fleets are inferior to his, and our troops less numerous and less efficient; the ships and the troops will do the work without the fortresses, but the fortresses will be of no avail without the same preponderance of ships and a larger amount of troops. It is to be hoped, then, that no financial effort to provide fortresses, which are not essential, may be permitted to cripple the establishment of the fleet, and the troops, which are essential not only to the military defence and security of England, but likewise to the *uninterrupted* progress of every class of her inhabitants engaged in or affected by the pursuits of trade, commerce, and industry, in their infinite and complicated ramifications.

TABLE No. 1.—SUMMARY of TWELVE MILITARY DIVISIONS proposed for GREAT BRITAIN in reference to ORGANISATION of VOLUNTEER FORCES, showing the relative force of VOLUNTEERS that each DIVISION can furnish on different scales in proportion to their TOTAL NUMBER of MALES capable of bearing ARMS, and the best proportion suited to the required FORCE for each DIVISION.

DIVISION.	Area in Square Miles.	Estimated Effective Volunteers.				
		1-20th of Adult Males.	1-10th of Adult Males.	1-5th of Adult Males.	Best suited for Requirements of the Different Divisions.	
					Proportion of Adult Males.	Number.
1. London Division	122	29,511	59,042	118,099	4-20ths	118,099
2. South-Eastern Division	6,352	20,560	40,764	81,600	,,	81,600
3. South Midland Division	5,002	15,265	30,832	61,689	3-20ths	45,795
4. Eastern Division	5,022	13,899	27,823	55,672	,,	41,697
5. South-Western Division	7,804	22,505	45,047	90,135	4-20ths	90,135
6. West Midland Division	6,013	26,624	53,286	106,614	1-20th	26,624
7. North Midland Division	5,527	15,161	30,344	60,707	,,	15,161
8. North-Western Division	3,144	31,252	62,504	125,008	,,	31,252
9. York Division	5,710	22,337	44,704	89,433	,,	22,337
10. Northern Division	5,457	12,100	24,211	48,438	,,	12,100
11. Welsh Division	8,167	14,842	29,700	59,418	,,	14,842
12. Scotch Division	31,324	36,108	72,218	144,436	,,	36,108
Total of Great Britain	89,644	260,164	520,475	1,041,249	..	535,750

TABLE No. 2.—SUMMARY of DIVISIONS, showing the COUNTIES included in each, and the relative force of VOLUNTEERS that can be furnished by each DIVISION and COUNTY, on different scales, in proportion to their TOTAL NUMBER of MALES capable of bearing ARMS; also the most suitable proportion for the required FORCE of each DIVISION and COUNTY.

DIVISION AND COUNTY.	Area in Square Miles.	Estimated Effective Volunteers.				
		1-20th of Adult Males.	1-10th of Adult Males.	1-5th of Adult Males.	Best suited for Requirements of the Different Divisions.	
					Proportion of Adult Males.	Number.
1. LONDON—						
Middlesex (part of)	51	21,808	43,630	87,271	4-20ths	87,271
Surrey (part of)	36	6,026	12,058	24,119	,,	24,119
Kent (part of)	35	1,677	3,354	6,709	,,	6,709
	122	29,511	59,042	118,099	,,	118,099
2. SOUTH-EASTERN—						
1. Surrey	744	2,525	5,057	10,122	4-20ths	10,122
2. Kent	1,584	6,050	12,113	24,261	,,	24,261
3. Sussex	1,484	4,286	8,580	17,171	,,	17,171
4. Hampshire	1,658	5,014	10,039	20,090	,,	20,090
5. Berkshire	882	2,685	4,975	9,956	,,	9,956
	6,352	20,560	40,764	81,600	,,	81,600
3. SOUTH MIDLAND—						
6. Middlesex (part of)	276	1,879	3,762	7,528	3-20ths	5,637
7. Hertfordshire	669	2,172	4,346	8,695	,,	6,516
8. Buckinghamshire	629	1,792	3,588	7,179	,,	5,376
9. Oxfordshire	749	2,124	4,253	8,507	,,	6,372
10. Northamptonshire	988	2,628	5,341	10,686	,,	7,884
11. Huntingdonshire	321	753	1,506	3,013	,,	2,259
12. Bedfordshire	477	1,619	3,242	6,488	,,	4,857
13. Cambridgeshire	893	2,298	4,794	9,593	,,	6,894
	5,002	15,265	30,832	61,689	,,	45,795

Table No. 2.—Summary of Divisions—*continued.*

DIVISION AND COUNTY.	Area in Square Miles.	Estimated Effective Volunteers.				
		1-20th of Adult Males.	1-10th of Adult Males.	1-5th of Adult Males.	Best suited for Requirements of the Different Divisions.	
					Proportion of Adult Males.	Number.
4. EASTERN—						
14. Essex	1,536	4,293	8,594	17,197	3-20th	12,879
15. Suffolk	1,454	4,194	8,395	16,799	,,	12,582
16. Norfolk	2,032	5,412	10,834	21,676	,,	16,236
	5,022	13,899	27,823	55,672	,,	41,697
5. SOUTH-WESTERN—						
17. Wiltshire	1,216	3,005	6,016	12,042	4-20th	12,042
18. Dorsetshire	962	2,208	4,422	8,850	,,	8,850
19. Devonshire	2,671	7,146	14,301	28,611	,,	28,611
20. Cornwall	1,377	4,451	8,909	17,826	,,	17,826
21. Somersetshire	1,578	5,695	11,399	22,806	,,	22,806
	7,804	22,505	45,047	90,135	,,	90,135
6. WEST MIDLAND—						
22. Gloucestershire	1,119	5,237	10,481	20,968	1-20th	5,237
23. Herefordshire	665	1,236	2,474	4,953	,,	1,236
24. Shropshire	1,413	3,055	6,117	12,240	,,	3,055
25. Staffordshire	1,179	7,873	15,756	31,521	,,	7,873
26. Worcestershire	678	3,227	6,461	12,931	,,	3,227
27. Warwickshire.	959	5,996	11,997	24,001	,,	5,996
	6,013	26,624	53,286	106,614	,,	26,624
7. NORTH MIDLAND—						
28. Leicestershire	831	2,932	5,869	11,743	1-20th	2,932
29. Rutlandshire	168	303	606	1,213	,,	303
30. Lincolnshire	2,718	4,995	10,000	20,005	,,	4,995
31. Nottinghamshire	937	3,676	7,355	14,715	,,	3,676
32. Derbyshire	873	3,255	6,514	13,031	,,	3,255
	5,527	15,161	30,344	60,707	,,	15,161
8. NORTH-WESTERN—						
33. Cheshire	1,083	5,416	10,832	21,664	1-20th	5,416
34. Lancashire	2,061	25,836	51,672	103,344	,,	25,836
	3,144	31,252	62,504	125,008	,,	31,252
9. YORK—						
35. West Riding	2,637	16,737	33,489	66,992	1-20th	16,737
36. East Riding and York	1,142	3,174	6,355	12,715	,,	3,174
37. North Riding	1,931	2,426	4,860	9,726	,,	2,426
	5,710	22,337	44,704	89,433	,,	22,337
10. NORTHERN—						
38. Durham	1,178	5,142	10,287	20,578	1-20th	5,142
39. Northumberland	1,952	3,790	7,583	15,172	,,	3,790
40. Cumberland	1,565	2,440	4,883	9,770	,,	2,440
41. Westmoreland	762	728	1,458	2,918	,,	728
	5,457	12,100	24,211	48,438	,,	12,100
11. WELSH—						
42. Monmouthshire	676	2,213	4,425	8,853	1-20th	2,213
43. South Wales	4,401	7,583	15,175	30,360	,,	7,583
44. North Wales	3,090	5,046	10,100	20,205	,,	5,046
	8,167	14,842	29,700	59,418	,,	14,842
12. SCOTCH—						
45. Southern Counties	9,000	22,669	45,339	90,678	1-20th	22,669
46. Northern Counties	22,324	13,439	26,879	53,758	,,	13,439
	31,324	36,108	72,218	144,436	,,	36,108
	89,644	260,164	520,475	1,041,249	,,	535,750

No. I. DIVISION.—LONDON.

Volunteer Force should be 4-20ths of Males capable of bearing Arms.

COUNTIES AND DISTRICTS.	Total Males capable of bearing Arms.	Effective Volunteers required.
MIDDLESEX.		
West Districts.		
1 Kensington	30,000	6,000
2 Chelsea	14,134	2,826
3 St. George's, Hanover Square	18,307	3,661
4 Westminster	16,402	3,280
5 St. Martin-in-the-Fields	6,160	1,232
6 St. James, Westminster	9,101	1,820
	94,105	18,819
North Districts.		
7 Marylebone	39,424	7,884
8 Hampstead	2,996	599
9 Pancras	41,739	8,347
10 Islington	23,832	4,766
11 Hackney	14,607	2,921
	122,598	24,517
Central Districts.		
12 St. Giles	13,553	2,710
13 Strand	11,115	2,223
14 Holborn	11,655	2,331
15 Clerkenwell	16,194	3,238
16 St. Luke	13,514	2,702
17 East London	11,101	2,220
18 West London	7,197	1,439
19 London City	13,983	2,798
	98,312	19,661
East Districts.		
20 Shoreditch	27,314	5,463
21 Bethnal Green	22,548	4,509
22 Whitechapel	19,940	3,988
23 St. George-in-the-East	12,094	2,418
24 Stepney	27,694	5,538
25 Poplar	11,790	2,358
	121,380	24,274
SURREY.		
South Districts.		
26 St. Saviour, Southwark	8,933	1,786
27 St. Olave, Southwark	4,844	968
28 Bermondsey	12,032	2,406
29 St. George, Southwark	12,956	2,591
30 Newington	16,204	3,240
31 Lambeth	34,831	6,966
32 Wandsworth	12,691	2,538
33 Camberwell	13,667	2,733
34 Rotherhithe	4,451	891
	120,609	24,119
KENT.		
35 Greenwich	24,841	4,968
36 Lewisham	8,709	1,741
	33,550	6,709
Total of No. I. Division	590,554	118,099

No. II. DIVISION.—SOUTH EASTERN.

Volunteer Force should be 4-20ths of Males capable of bearing Arms.

COUNTIES AND DISTRICTS.	Total Males capable of bearing Arms.	Effective Volunteers required.
1. SURREY—exclusive of London Districts.		
37 Epsom	4,760	952
38 Chertsey	4,037	807
39 Guildford	6,268	1,253
40 Farnham	2,936	587
41 Farnborough	1,960	392
42 Hambledon	3,388	677
43 Dorking	2,838	567
44 Reigate	3,582	716
45 Godstone	2,217	443
46 Croydon	7,972	1,594
47 Kingston	6,696	1,339
48 Richmond	3,976	795
	50,630	10,122
2. KENT—exclusive of London Districts.		
49 Bromley	4,409	881
50 Dartford	6,832	1,366
51 Gravesend	4,158	831
52 North Aylesford	4,142	828
53 Hoo	711	142
54 Medway	10,699	2,139
55 Malling	4,895	979
56 Sevenoaks	5,524	1,104
57 Tunbridge	7,136	1,427
58 Maidstone	9,024	1,804
59 Hollingbourn	3,438	687
60 Cranbrook	3,267	653
61 Tenterden	2,820	564
62 West Ashford	3,328	665

No. II. DIVISION—*continued.*

COUNTIES AND DISTRICTS.	Total Males capable of bearing Arms.	Effective Volunteers required.
Kent—continued.		
63 East Ashford	2,990	598
64 Bridge	2,791	558
65 Canterbury	3,525	705
66 Blean	3,665	733
67 Faversham	4,171	834
68 Milton	3,006	601
69 Sheppey	3,346	669
70 Thanet	7,949	1,589
71 Eastry	6,290	1,258
72 Dover	7,081	1,416
73 Elham	4,695	939
74 Romney Marsh	1,359	271
	121,251	24,261
3. SUSSEX.		
75 Rye	3,087	616
76 Hastings	5,304	1,061
77 Battle	3,558	711
78 Eastbourne	2,087	417
79 Hailsham	3,322	664
80 Ticehurst	3,877	775
81 Uckfield	4,408	881
82 East Grinstead	3,304	660
83 Cuckfield	3,902	780
84 Lewes	6,430	1,286
85 Brighton	16,392	3,278
86 Steyning	4,217	843
87 Horsham	3,504	700
88 Petworth	2,407	481
89 Thakeham	1,858	371
90 Worthing	4,686	937
91 Westhampnett	3,662	732
92 Chichester	3,759	751
93 Midhurst	3,400	680
94 Westbourne	1,736	347
	84,900	17,171
4. HAMPSHIRE.		
95 Havant	1,803	360
96 Portsea Island	18,031	3,606
97 Alverstoke	4,227	845
Hampshire—continued.		
98 Fareham	3,481	696
99 Isle of Wight	12,581	2,516
100 Lymington	3,038	607
101 Christchurch	2,120	424
102 Ringwood	1,419	283
103 Fordingbridge	1,708	341
104 New Forest	3,385	677
105 Southampton	8,524	1,704
106 South Stoneham	3,993	798
107 Romsey	2,702	540
108 Stockbridge	1,870	374
109 Winchester	6,415	1,283
110 Droxford	2,674	534
111 Catherington	623	124
112 Petersfield	1,953	390
113 Alresford	1,854	370
114 Alton	2,977	595
115 Hartley Wintney	2,806	561
116 Basingstoke	4,366	873
117 Whitchurch	1,405	281
118 Andover	4,316	863
119 Kingsclere	2,227	445
	100,498	20,090
5. BERKSHIRE.		
120 Newbury	5,204	1,040
121 Hungerford	5,101	1,020
122 Faringdon	3,933	786
123 Abingdon	5,236	1,047
124 Wantage	4,358	871
125 Wallingford	3,541	708
126 Bradfield	4,095	819
127 Reading	5,544	1,108
128 Wokingham	3,417	683
129 Cookham	2,942	588
130 Easthampstead	1,588	317
131 Windsor	4,847	969
	49,806	9,956
Total of No. II. Division	407,085	81,600

No. III. DIVISION.—SOUTH MIDLAND.

Volunteer Force should be 3-20ths of Males capable of bearing Arms.

COUNTIES AND DISTRICTS.	Total Males capable of bearing Arms.	Effective Volunteers required.
6. MIDDLESEX—exclusive of the London Districts.		
132 Staines	3,493	522
133 Uxbridge	4,869	729
134 Brentford	10,331	1,548
135 Hendon	3,979	594
136 Barnet	3,655	546
137 Edmonton	11,324	1,698
	37,651	5,637
7. HERTFORDSHIRE.		
138 Ware	4,120	618
139 Bishop Stortford	5,089	762
140 Royston	6,589	987
141 Hitchin	6,182	927
142 Hertford	3,772	564
143 Hatfield	2,125	318
144 St. Albans	4,501	675
145 Watford	4,700	705
146 Hemel Hempstead	3,280	492
147 Berkhamstead	3,132	468
	43,490	6,516

No. III. DIVISION—*continued.*

COUNTIES AND DISTRICTS.	Total Males capable of bearing Arms.	Effective Volunteers required.
8. BUCKINGHAMSHIRE.		
148 Amersham	4,659	696
149 Eton	5,372	804
150 Wycombe	8,390	1,257
151 Aylesbury	5,768	864
152 Winslow	2,344	351
153 Newport Pagnell	5,777	864
154 Buckingham	3,602	540
	35,912	5,376
9. OXFORDSHIRE.		
155 Henley	4,474	669
156 Thame	3,910	585
157 Headington	3,943	591
158 Oxford	5,043	756
159 Bicester	3,890	582
160 Woodstock	3,613	540
161 Witney	5,889	882
162 Chipping Norton	4,357	651
163 Banbury	7,442	1,116
	42,561	6,372
10. NORTHAMPTONSHIRE.		
164 Brackley	3,437	513
165 Towcester	3,201	360
166 Potterspury	2,666	399
167 Hardingstone	2,289	342
168 Northampton	8,464	1,269
169 Daventry	5,481	822
170 Brixworth	3,693	402
171 Wellingborough	5,342	801
172 Kettering	4,524	828
173 Thrapston	3,210	480
174 Oundle	3,914	585
175 Peterborough	7,239	1,083
	53,460	7,884

COUNTIES AND DISTRICTS.	Total Males capable of bearing Arms.	Effective Volunteers required.
11. HUNTINGDONSHIRE.		
176 Huntingdon	5,225	783
177 St. Ives	5,148	771
178 St. Neots	4,706	705
	15,079	2,259
12. BEDFORDSHIRE.		
179 Bedford	8,880	1,332
180 Biggleswade	5,859	876
181 Ampthill	4,135	618
182 Woburn	3,019	450
183 Leighton Buzzard	4,285	642
184 Luton	6,272	939
	32,450	4,857
13. CAMBRIDGESHIRE.		
185 Caxton	2,766	114
186 Chesterton	6,292	942
187 Cambridge	6,954	1,041
188 Linton	3,537	528
189 Newmarket	7,664	1,149
190 Ely	5,724	858
191 North Witchford	4,061	618
192 Whittlesey	1,922	288
193 Wisbeach	9,054	1,356
	47,974	6,894
Total of No. III. Division	308,577	45,795

No. IV. DIVISION.—EASTERN.

Volunteer Force should be 3-20ths of Males capable of bearing Arms.

COUNTIES AND DISTRICTS.	Total Males capable of bearing Arms.	Effective Volunteers required.
14. ESSEX.		
194 West Ham	8,599	1,287
195 Epping	3,908	585
196 Ongar	2,964	444
197 Romford	6,152	921
198 Orsett	2,660	399
199 Billericay	3,447	516
200 Chelmsford	8,068	1,209
201 Rochford	3,959	591
202 Maldon	5,534	828

COUNTIES AND DISTRICTS.	Total Males capable of bearing Arms.	Effective Volunteers required.
Essex—*continued.*		
203 Tendring	6,927	1,038
204 Colchester	4,861	729
205 Lexden	5,416	810
206 Witham	4,025	603
207 Halstead	4,818	720
208 Braintree	4,390	657
209 Dunmow	5,124	768
210 Saffron Walden	5,179	774
	86,031	12,879

No. IV. DIVISION—*continued.*

COUNTIES AND DISTRICTS.	Total Males capable of bearing Arms.	Effective Volunteers required.
15. SUFFOLK.		
211 Risbridge	4,531	678
212 Sudbury	7,703	1,155
213 Cosford	4,527	678
214 Thingoe	4,753	711
215 Bury St. Edmunds	3,475	519
216 Mildenhall	2,588	387
217 Stow	5,277	789
218 Hartismere	4,757	711
219 Hoxne	3,975	594
220 Bosmere	4,305	645
221 Samford	3,123	468
222 Ipswich	8,189	1,227
223 Woodbridge	5,944	891
224 Plomesgate	5,369	804
225 Blything	6,971	1,044
226 Wangford	3,503	525
227 Mutford	5,041	756
	84,031	12,582
16. NORFOLK.		
228 Yarmouth	6,720	1,008
229 Flegg	2,124	318
230 Tunstead	3,903	585
Norfolk—*continued.*		
231 Erpingham	5,430	813
232 Aylsham	5,002	750
233 St. Faith's	2,972	444
234 Norwich	17,049	2,556
235 Forehoe	3,391	507
236 Henstead	2,886	432
237 Blofield	2,893	432
238 Loddon	3,774	564
239 Depwade	6,599	987
240 Guiltcross	3,186	477
241 Wayland	3,035	453
242 Mitford	7,347	1,101
243 Walsingham	5,470	819
244 Docking	4,537	678
245 Freebridge Lynn	3,389	507
246 King's Lynn	5,132	768
247 Downham	5,246	786
248 Swaffham	3,580	537
249 Thetford	4,760	714
	108,425	16,236
Total of No. IV. Division	278,487	41,697

No. V. DIVISION.—SOUTH-WESTERN.

Volunteer Force should be 4-20ths of Males capable of bearing Arms.

COUNTIES AND DISTRICTS.	Total Males capable of bearing Arms.	Effective Volunteers required.
17. WILTSHIRE.		
250 Highworth	4,405	881
251 Cricklade	2,850	570
252 Malmsbury	3,725	745
253 Chippenham	5,352	1,070
254 Calne	2,293	458
255 Marlborough	2,566	513
256 Devizes	5,559	1,111
257 Melksham	4,704	940
258 Bradford	2,902	580
259 Westbury	3,132	626
260 Warminster	4,267	853
261 Pewsey	3,126	625
262 Amesbury	2,062	412
263 Alderbury	3,727	745
264 Salisbury	2,232	446
265 Wilton	2,685	537
266 Tisbury	2,545	509
267 Mere	2,106	421
	60,240	12,042
18. DORSETSHIRE.		
268 Shaftesbury	3,257	651
269 Sturminster	2,595	519
270 Blandford	3,709	741
271 Wimborne	4,321	864
272 Poole	3,222	644
orsetshire—*continued.*		
273 Wareham	4,354	870
274 Weymouth	5,509	1,101
275 Dorchester	6,250	1,250
276 Sherborne	3,270	654
277 Beaminster	3,567	713
278 Bridport	4,216	843
	44,270	8,850
19. DEVONSHIRE.		
279 Axminster	5,076	1,015
280 Honiton	5,956	1,191
281 St. Thomas	12,201	2,440
282 Exeter	8,206	1,641
283 Newton Abbot	13,076	2,615
284 Totnes	8,505	1,701
285 Kingsbridge	5,344	1,068
286 Plympton St. Mary	4,931	986
287 Plymouth	13,055	2,611
288 East Stonehouse	2,995	599
289 Stoke Damerel	9,545	1,909
290 Tavistock	6,962	1,392
291 Okehampton	5,100	1,020
292 Crediton	5,432	1,086
293 Tiverton	9,891	1,978
294 South Molton	5,141	1,028

No. V. DIVISION—*continued.*

COUNTIES AND DISTRICTS.	Total Males capable of bearing Arms.	Effective Volunteers required.
Devonshire—*continued.*		
295 Barnstaple	9,544	1,908
296 Torrington	4,373	874
297 Bideford	4,902	980
298 Holsworthy	2,845	569
	143,080	28,611
20. CORNWALL.		
299 Stratton	2,145	429
300 Camelford	2,112	422
301 Launceston	4,193	838
302 St. German's	4,136	827
303 Liskeard	8,458	1,691
304 Bodmin	5,123	1,024
305 St. Columb	4,350	870
306 St. Austell	8,018	1,603
307 Truro	10,567	2,113
308 Falmouth	5,513	1,102
309 Helston	7,100	1,420
310 Redruth	13,407	2,681
311 Penzance	13,379	2,675
312 Scilly Islands	657	131
	89,158	17,826
21. SOMERSETSHIRE.		
313 Williton	4,974	994
314 Wellington	5,530	1,106
315 Taunton	8,778	1,755
316 Bridgwater	8,297	1,659
317 Langport	4,642	928
318 Chard	6,521	1,304
319 Yeovil	7,116	1,422
320 Wincanton	5,328	1,065
321 Frome	6,331	1,266
322 Shepton Mallet	4,239	847
323 Wells	5,335	1,067
324 Axbridge	8,265	1,653
325 Clutton	6,307	1,261
326 Bath	17,462	3,492
327 Keynsham	5,404	1,080
328 Bedminster	9,536	1,907
	114,065	22,806
Total of No. V. Division	450,813	90,135

No. VI. DIVISION.—WEST MIDLAND.

Volunteer Force should be 1-20th of Males capable of bearing Arms.

COUNTIES AND DISTRICTS.	Total Males capable of bearing Arms.	Effective Volunteers required.
22. GLOUCESTERSHIRE.		
329 Bristol	16,429	821
330 Clifton	19,487	974
331 Chipping Sodbury	4,631	231
332 Thornbury	4,113	205
333 Dursley	3,701	185
334 Westbury on Severn	4,531	226
335 Newent	3,144	157
336 Gloucester	8,011	400
337 Wheatenhurst	1,997	99
338 Stroud	9,346	467
339 Tetbury	1,563	78
340 Cirencester	5,332	266
341 Northleach	2,746	137
342 Stow-on-the-Wold	2,483	124
343 Winchcomb	2,534	126
344 Cheltenham	11,046	552
345 Tewkesbury	3,783	189
	104,877	5,237
23. HEREFORDSHIRE.		
346 Ledbury	3,285	164
347 Ross	3,875	193
348 Hereford	8,788	439
349 Weobly	2,179	108
350 Bromyard	2,923	146
351 Leominster	3,727	186
	24,777	1,236
24. SHROPSHIRE.		
352 Ludlow	4,263	213
353 Clun	2,530	126
354 Church Stretton	1,542	77
355 Cleobury Mortimer	2,158	107
356 Bridgnorth	3,902	195
357 Shiffnal	2,871	143
358 Madeley	6,907	345
359 Atcham	4,793	239
360 Shrewsbury	5,776	288
361 Oswestry	5,699	284
362 Ellesmere	3,920	196
363 Wem	4,237	211
364 Market Drayton	3,540	177
365 Wellington	5,182	259
366 Newport	3,905	195
	61,225	3,055
25. STAFFORDSHIRE.		
367 Stafford	5,697	284
368 Stone	4,836	241
369 Newcastle-under-Lyme	5,203	260
370 Wolstanton	10,479	523
371 Stoke-upon-Trent	14,485	724
372 Leek	5,758	287
373 Cheadle	4,535	226
374 Uttoxeter	3,785	189
375 Burton-upon-Trent	7,961	398
376 Tamworth	3,499	174
377 Lichfield	6,320	316

No. VI. DIVISION—*continued.*

COUNTIES AND DISTRICTS.	Total Males capable of bearing Arms.	Effective Volunteers required.
Staffordshire—*continued.*		
378 Penkridge	4,212	210
379 Wolverhampton	26,039	1,301
380 Walsall	10,761	538
381 West Bromwich	17,432	871
382 Dudley	26,632	1,331
	157,634	7,873
26. WORCESTERSHIRE.		
383 Stourbridge	14,337	716
384 Kidderminster	8,229	411
385 Tenbury	1,762	88
386 Martley	3,453	172
387 Worcester	6,919	345
388 Upton-on-Severn	4,517	225
389 Evesham	3,616	180
390 Pershore	3,388	169
391 Droitwich	4,538	226
392 Bromsgrove	6,205	310
393 Kings Norton	7,718	385
	64,682	3,227

COUNTIES AND DISTRICTS.	Total Males capable of bearing Arms.	Effective Volunteers required.
27. WARWICKSHIRE.		
394 Birmingham	43,488	2,174
395 Aston	16,713	835
396 Menden	2,817	140
397 Atherstone	2,862	143
398 Nuneaton	3,383	169
399 Foleshill	4,872	243
400 Coventry	9,203	460
401 Rugby	5,869	293
402 Solihull	2,983	149
403 Warwick	10,483	524
404 Stratford-on-Avon	5,197	259
405 Alcester	4,370	218
406 Shipston-on-Stour	5,163	258
407 Southam	2,626	131
	120,029	5,996
Total of No. VI. Division	533,224	26,624

No. VII. DIVISION.—NORTH MIDLAND.

Volunteer Force should be 1-20th of Males capable of bearing Arms.

COUNTIES AND DISTRICTS.	Total Males capable of bearing Arms.	Effective Volunteers required.
28. LEICESTERSHIRE.		
408 Lutterworth	4,048	202
409 Market Harborough	3,960	198
410 Billesdon	1,752	87
411 Blaby	3,547	177
412 Hinckley	3,899	194
413 Market Bosworth	3,408	170
414 Ashby-de-la-Zouch	6,474	323
415 Loughborough	6,342	317
416 Barrow-on-Soar	5,013	250
417 Leicester	15,160	758
418 Melton Mowbray	5,133	256
	58,738	2,932
29. RUTLANDSHIRE.		
419 Oakham	2,878	143
420 Uppingham	3,190	160
	6,068	303

COUNTIES AND DISTRICTS.	Total Males capable of bearing Arms.	Effective Volunteers required.
30. LINCOLNSHIRE.		
421 Stamford	4,939	246
422 Bourn	5,590	279
423 Spalding	5,322	266
424 Holbeach	4,783	239
425 Boston	9,611	480
426 Sleaford	6,138	306
427 Grantham	7,462	373
428 Lincoln	10,517	525
429 Horncastle	6,272	313
430 Spilsby	7,234	361
431 Louth	8,357	417
432 Caistor	8,573	428
433 Glanford Brigg	8,446	422
434 Gainsborough	6,814	340
	100,056	4,995
31. NOTTINGHAMSHIRE.		
435 East Retford	5,689	284
436 Worksop	4,788	239
437 Mansfield	7,536	376
438 Basford	16,231	811
439 Radford	6,694	334
440 Nottingham	14,605	730
441 Southwell	6,404	320
442 Newark	7,587	379
443 Bingham	4,060	203
	73,594	3,676

No. VII. DIVISION—*continued.*

COUNTIES AND DISTRICTS.	Total Males capable of bearing Arms.	Effective Volunteers required.	COUNTIES AND DISTRICTS.	Total Males capable of bearing Arms.	Effective Volunteers required.
32. DERBYSHIRE.			Derbyshire—*continued.*		
			449 Bakewell	7,470	373
			450 Chapel-en-le-Frith	2,874	143
444 Shardlow	8,080	404	451 Hayfield	7,428	371
445 Derby	10,921	546			
446 Belper	11,718	585		65,173	3,255
447 Ashborne	5,233	261			
448 Chesterfield	11,449	572	Total of No. VII. Division	303,629	15,161

No. VIII. DIVISION.—NORTH-WESTERN.

Volunteer Force should be 1-20th of Males capable of bearing Arms.

COUNTIES AND DISTRICTS.	Total Males capable of bearing Arms.	Effective Volunteers required.	COUNTIES AND DISTRICTS.	Total Males capable of bearing Arms.	Effective Volunteers required.
33. CHESHIRE.			Lancashire—*continued.*		
452 Stockport	25,052	1,252	469 Bury	22,204	1,110
453 Macclesfield	15,832	791	470 Barton-upon-Irwell	7,896	395
454 Altrincham	8,511	425	471 Chorlton	30,960	1,548
455 Runcorn	6,452	322	472 Salford	21,881	1,094
456 Northwich	7,800	390	473 Manchester	57,108	2,855
457 Congleton	7,628	381	474 Ashton-under-Lyne	29,780	1,489
458 Nantwich	9,496	475	475 Oldham	21,697	1,085
459 Great Boughton (Chester)	13,321	666	476 Rochdale	18,129	906
460 Wirrall	14,289	714	477 Haslingden	12,606	630
			478 Burnley	15,967	798
			479 Clitheroe	5,592	280
	108,381	5,416	480 Blackburn	22,684	1,134
			481 Chorley	9,425	471
34. LANCASHIRE.			482 Preston	24,136	1,207
			483 Fylde	5,500	275
			484 Garstang	3,174	159
			485 Lancaster	8,665	433
461 Liverpool	64,509	3,225	486 Ulverstone	7,639	382
462 West Derby	38,319	1,916			
463 Prescot	14,018	701			
464 Ormskirk	9,577	479		516,643	25,836
465 Wigan	19,385	969			
466 Warrington	9,041	452			
467 Leigh	8,183	409			
468 Bolton	28,678	1,434	Total of No. VIII. Division	625,024	31,252

No. IX. DIVISION.—YORK.

Volunteer Force should be 1-20th of Males capable of bearing Arms.

COUNTIES AND DISTRICTS.	Total Males capable of bearing Arms.	Effective Volunteers required.
35. WEST RIDING.		
487 Sedbergh	1,143	57
488 Settle	3,440	172
489 Skipton	7,191	359
490 Pateley Bridge	1,895	94
491 Ripon	4,662	233
492 Knaresborough	6,946	347
493 Otley	7,161	358
494 Keighley	11,476	573
495 Todmorden	7,432	371
496 Saddleworth	4,450	222
497 Huddersfield	30,963	1,548
498 Halifax	30,239	1,511
499 Bradford	45,491	2,274
500 Hunslet	22,170	1,108
501 Leeds	25,336	1,266
502 Dewsbury	17,942	897
503 Wakefield	12,239	611
504 Pontefract	7,484	374
504a Hemsworth	2,039	101
505 Barnsley	8,745	437
506 Wortley	8,003	400
507 Ecclesall Bierlow	9,478	473
508 Sheffield	25,906	1,295
509 Rotherham	8,270	413
510 Doncaster	8,669	433
511 Thorne	3,971	198
512 Goole	3,421	171
513 Selby	3,857	192
514 Tadcaster	4,988	249
	335,009	16,737

COUNTIES AND DISTRICTS.	Total Males capable of bearing Arms.	Effective Volunteers required.
36. EAST RIDING (with York City).		
515 York	14,279	713
516 Pocklington	4,024	201
517 Howden	3,609	180
518 Beverley	5,010	250
519 Sculcoates	11,180	559
520 Hull	12,667	633
521 Patrington	2,352	117
522 Skirlaugh	2,320	116
523 Driffield	4,566	226
524 Bridlington	3,580	179
	63,587	3,174
37. NORTH RIDING.		
525 Scarborough	6,154	307
526 Malton	5,782	289
527 Easingwold	2,862	143
528 Thirsk	3,190	159
529 Helmsley	3,114	155
530 Pickering	2,494	124
531 Whitby	5,398	269
532 Guisbrough	3,050	152
533 Stokesley	2,166	108
534 Northallerton	3,115	155
535 Bedale	2,245	112
536 Leyburn	2,514	125
537 Askrigg	1,409	70
538 Reeth	1,705	85
539 Richmond	3,461	173
	48,659	2,426
Total of No. IX. Division	447,255	22,337

No. X. DIVISION.—NORTHERN.

Volunteer Force should be 1-20th of Males capable of bearing Arms.

COUNTIES AND DISTRICTS.	Total Males capable of bearing Arms.	Effective Volunteers required.
38. DURHAM.		
540 Darlington	5,404	270
541 Stockton	13,233	661
542 Auckland	7,521	376
543 Teesdale	4,953	247
544 Weardale	3,642	182
545 Durham	13,988	699
546 Easington	5,449	272
547 Houghton-le-Spring	4,891	244
548 Chester-le-Street	5,227	261
549 Sunderland	17,644	882
550 South Shields	8,947	447
551 Gateshead	12,020	601
	102,919	5,142

COUNTIES AND DISTRICTS.	Total Males capable of bearing Arms.	Effective Volunteers required.
39. NORTHUMBERLAND.		
552 Newcastle-upon-Tyne	22,289	1,114
553 Tynemouth	16,062	803
554 Castle Ward	3,474	173
555 Hexham	7,609	380
556 Haltwhistle	1,821	91
557 Bellingham	1,638	81
558 Morpeth	4,532	226
559 Alnwick	5,280	264
560 Belford	1,718	86
561 Berwick	6,023	301
562 Glendale	3,587	179
563 Rothbury	1,858	92
	75,891	3,790

No. X. DIVISION—*continued.*

COUNTIES AND DISTRICTS.	Total Males capable of bearing Arms.	Effective Volunteers required.
40. CUMBERLAND.		
564 Alston	1,704	85
565 Penrith	5,577	278
566 Brampton	2,831	141
567 Longtown	2,424	121
568 Carlisle	10,389	519
569 Wigton	5,915	295
570 Cockermouth	9,627	481
571 Whitehaven	8,903	445
572 Bootle	1,502	75
	48,872	2,440
41. WESTMORELAND.		
573 East Ward	3,415	170
574 West Ward	2,039	101
575 Kendal	9,143	457
	14,597	728
Total of No. X. Division	242,279	12,100

No. XI. OR WELSH DIVISION.

Volunteer Force should be 1-20th of Males capable of bearing Arms.

COUNTIES AND DISTRICTS.	Total Males capable of bearing Arms.	Effective Volunteers required.
42. MONMOUTHSHIRE.		
576 Chepstow	4,764	238
577 Monmouth	6,845	342
578 Abergavenny	14,807	740
579 Pontypool	6,998	350
580 Newport	10,868	543
	44,282	2,213
43. SOUTH WALES.		
Glamorganshire.		
581 Cardiff	11,623	581
582 Merthyr Tydfil	19,201	960
583 Bridgend	5,855	292
584 Neath	11,618	580
585 Swansea	11,727	586
	60,024	2,999
Carmarthenshire.		
586 Llanelly	5,877	293
587 Llandovery	3,764	188
588 Llandilofaur	4,492	224
589 Carmarthen	9,535	476
	23,668	1,181
Pembrokeshire.		
590 Narberth	5,532	276
591 Pembroke	5,740	287
592 Haverfordwest	9,845	492
	21,117	1,055
Cardiganshire.		
593 Cardigan	5,046	252
594 Newcastle-in-Emlyn	5,043	252
595 Lampeter	2,468	123
596 Aberayron	3,306	165
597 Aberystwith	5,938	296
598 Tregaron	2,601	130
	24,402	1,218
Brecknockshire.		
599 Builth	2,086	104
600 Brecknock	4,543	227
601 Crickhowell	5,424	271
602 Hay	2,740	137
	14,793	739
Radnorshire.		
603 Presteigne	3,787	189
604 Knighton	2,370	118
605 Rhayader	1,699	84
	7,856	391
44. SOUTH WALES.		
Montgomeryshire.		
606 Machynlleth	3,024	151
607 Newtown	6,277	313
608 Montgomery	5,095	254
609 Llanfyllin	4,884	244
	19,280	962
Flintshire.		
610 Holywell	10,261	513
Denbighshire.		
611 Wrexham	10,574	528
612 Ruthin	4,213	210
613 St. Asaph	6,322	316
614 Llanrwst	3,119	155
	24,228	1,209
Merionethshire.		
615 Corwen	3,854	192
616 Bala	1,684	84
617 Dolgelly	3,243	162
618 Festiniog	4,045	202
	12,826	640
Carnarvonshire.		
619 Pwllheli	5,447	272
620 Carnarvon	7,611	380
621 Bangor	7,702	385
622 Conway	2,907	145
	23,667	1,182
Anglesey.		
623 Anglesey	10,811	540
Total of No. XI. Division	297,095	14,842

No. XII. or SCOTCH DIVISION.

Volunteer Force should be 1-20th of Males capable of bearing Arms.

COUNTIES AND DISTRICTS.	Total Males capable of bearing Arms.	Effective Volunteers required.
SOUTHERN COUNTIES.		
Dumfries.		
625 Eskdale	1,959	98
626 Annandale	8,785	439
627 Nithsdale	8,787	439
	19,531	976
Kirkcudbright.		
628 East Kirkcudbright	7,551	378
629 West Kirkcudbright	3,230	162
	10,781	540
Wigtown.		
630 Wigtown	10,847	542
Ayrshire.		
631 Carrick	7,823	391
632 Kyle	18,071	903
633 Cunninghame	21,568	1,078
	47,462	2,372
Buteshire.		
634 Arran	1,487	74
635 Bute	2,665	133
	4,152	207
Renfrewshire.		
636 Renfrew, Lower	12,218	611
637 Renfrew, Upper	28,055	1,403
	40,273	2,014
Dumbarton.		
638 Dumbarton	11,276	564
Lanarkshire.		
639 Glasgow City	86,247	4,312
640 Lanark, Lower	6,453	323
641 Lanark, Middle	29,777	1,489
642 Lanark, Upper	10,067	503
	134,544	6,627
Stirling.		
643 Stirling	21,559	1,078
Linlithgow.		
644 Linlithgow	7,534	377
Edinburghshire.		
645 Edinburgh, West	5,113	256
646 Edinburgh, City	48,482	2,424
647 Edinburgh, East	11,264	563
	64,859	3,243
Peebleshire.		
648 Peebles	2,685	134
Selkirkshire.		
649 Selkirk	2,452	123
Roxburghshire.		
650 Hawick	4,024	201
651 Melrose	2,690	135
652 Jedburgh	2,560	128
653 Kelso	3,637	182
	12,911	646
Berwickshire.		
654 Berwick	9,074	454
Haddington.		
655 Haddington	9,097	484
Fifeshire.		
656 St. Andrew's	8,019	401
657 Cupar	8,608	430
658 Kirkcaldy	12,955	648
659 Dunfermline	8,805	440
	38,387	1,919
Kinross-shire.		
660 Kinross	2,231	112
Clackmannan.		
661 Clackmannan	5,738	287
NORTHERN COUNTIES.		
Perthshire.		
662 Perth, West	5,246	263
663 Perth, East	23,861	1,193
664 Perth, City	5,558	278
	34,665	1,734
Forfarshire.		
665 Dundee	23,815	1,191
666 Forfar	24,001	1,200
	47,816	2,391
Kincardine.		
667 Kincardine	8,649	432
Aberdeenshire.		
668 Aberdeen	21,565	1,078
669 Kincardine O'Neil	3,985	199
670 Alford	3,166	158
671 Strathbogie	2,577	129
672 Garioch	4,537	227
673 Ellon	3,844	192
674 Deer, or Buchan	9,736	486
675 Turriff	3,998	180
	53,008	2,649
Banff.		
676 Banff	13,543	677
Elgin.		
677 Elgin	9,739	487

No. XII. DIVISION—*continued.*

COUNTIES AND DISTRICTS.	Total Males capable of bearing Arms.	Effective Volunteers required.
Nairn.		
678 Nairn . . .	2,489	124
Inverness.		
679 Inverness, East .	9,652	482
680 Inverness, West .	4,670	233
681 Inverness Islands .	9,803	490
	24,125	1,205
Argyleshire.		
682 Argyle . . .	4,305	215
683 Islay	3,975	199
684 Kintyre . . .	4,479	224
685 Cowal . . .	2,234	112
686 Lorn	3,534	176
687 Mull	3,797	190
	22,324	1,116
Ross and Cromarty.		
688 Lewis . . .	4,928	247
689 Ross, Wester . .	10,132	507
690 Ross, Easter . .	5,617	281
	20,677	1,035
Sutherland.		
691 Sutherland . .	6,448	323
Caithness.		
692 Caithness . . .	9,677	484
Orkney Islands.		
693 South Isles, Orkney .	1,342	67
694 Mainland, Orkney .	4,189	209
695 North Isles, Orkney .	2,332	117
696 Shetland Isles . .	7,769	389
	15,632	782
Total of No. XII. Division	722,185	36,108

GREAT BRITAIN

Shewing the

TERRITORIAL DIVISIONS

suited to a

MILITARY ORGANIZATION OF VOLUNTEER FORCES

And Coincident with the

Registration and Census Arrangements.

The Map *also exhibits the facility afforded by*

RAILWAY COMMUNICATION

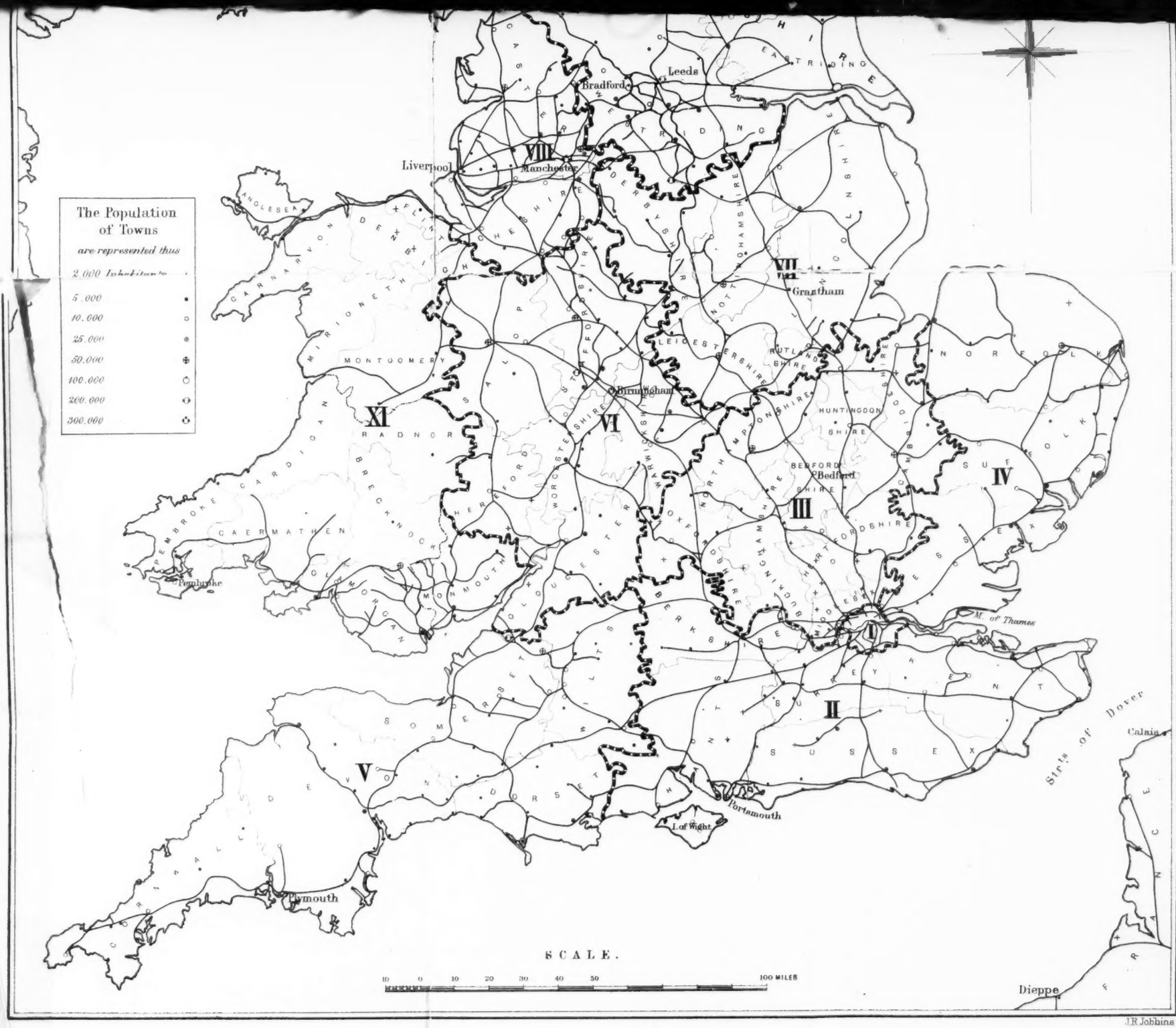
To concentrate Troops to any required point for

NATIONAL DEFENCE.

The Population of Towns

are represented thus

2,000 Inhabitants


The Population of Towns
are represented thus
2,000 Inhabitants
5,000
10,000
25,000
50,000
100,000
200,000
300,000
Leeds
Bradford
Liverpool
Manchester
Grantham
Birmingham
Bedford
Pembroke
Plymouth
Portsmouth
I. of Wight
Calais
Dieppe
Strts of Dover
M. of Thames
I
II
III
IV
V
VI
VII
VIII
XI
MONTGOMERY
RADNOR
CAERMATHEN
BRECKNOCK
PEMBROKE
CARDIGAN
MERIONETH
CARNARVON
ANGLESEA
DENBIGH
FLINT
CHESHIRE
STAFFORD
SHROPSHIRE
WORCESTER
GLOUCESTER
MONMOUTH
HEREFORD
LEICESTER
RUTLAND
NOTTINGHAM
DERBY
LINCOLN
YORK
NORTH
HUNTINGDON
CAMBRIDGE
NORFOLK
SUFFOLK
ESSEX
HERTFORD
BUCKINGHAM
OXFORD
BERKS
WILTS
SOMERSET
DORSET
DEVON
CORNWALL
SURREY
KENT
SUSSEX
SCALE.
10 0 10 20 30 40 50 100 MILES

J.R.Jobbins

Friday, March 23rd, 1860.

Sir SIBBALD SCOTT, BART. in the Chair.

A SCHEME FOR THE RE-ORGANIZATION, RECRUITING, AND INSTRUCTION OF THE ARMY.

Prepared by an Officer of Rank, and read by Colonel the Hon. JAMES LINDSAY, M.P.

PUBLIC attention has been for the last six years directed in a favourable manner towards the Army. The brilliant victories in the Crimea, and the calm endurance exhibited throughout that campaign; the splendid triumphs in India, and the dauntless heroism displayed in the suppression of the mutiny and rebellion, have had the effect of raising the character of the Army in the estimation of the country—which, owing to a long peace of 40 years' duration, broken only by occasional campaigns in India and at the Cape, did not receive that appreciation to which it was justly entitled.

For the first time since the Restoration, the Army is looked upon without fear and distrust. Even during the triumphant progress of the Peninsular War, statesmen were found ready to depreciate our Army, and to declaim against any attempt to raise a military spirit in the nation; now, however, the old cry that a standing Army, controlled by the provisions of an annual mutiny act, is dangerous to the liberties of the country, seems entirely exploded; and the necessity of retaining in the realm an adequate force to defend our shores, and an Army, as perfect in all its departments and matériel as can be obtained in peace, is now distinctly recognised.

Though great progress has been recently made towards the attainment of this object, and the position of the soldier has been much improved, yet it is necessary still further to increase the attraction of the profession, and so to organise the force as to make it as disposable and available as the foreign policy of the Government and the vast territorial dependencies of the Crown may require, and as efficient as professional instruction can render it.

For two centuries it has been the constant habit of this country, in its jealousy of a standing Army, to keep forces in time of peace barely sufficient to relieve troops stationed in the colonies. Large forces were raised for special emergencies, and as soon as the object which called them into existence had passed, they were reduced, both for the above reason and for the sake of temporary economy. The ruinous consequence of this policy is now a matter of history. War has always been commenced with an army utterly disproportioned to the object in view—without

reserves, with soldiers suddenly raised, and consequently inferior in discipline; and it has usually required the experience of a few years campaigning before England's Army appears in the field as in the days of Marlborough and Wellington, unrivalled in discipline and unsurpassed in organization. But no sooner has peace been proclaimed than the cry for reduction is raised; and, though it cannot be expected that a war establishment should be maintained in peace, yet reduction has generally been carried to a point so low as to paralyse the power of the nation, and provide troops no more than sufficient for colonial reliefs.

The following passage, from the writings of Dean Tucker, illustrates in forcible language the course of policy which has heretofore prevailed as regards the Army.

"The *Patriot* and furious *Anti-Courtier* loudly exclaims against even a small Parliamentary Army, both on account of its danger and expense. By persevering in these laudable endeavours he prevents such a number of forces being kept up as are necessary for the common safety of the kingdom. The consequence is, when a war breaks out, new levies are half-formed and half-disciplined, and the officers novices in their business. Thus the nation is involved in expenses ten times as great, and made to raise forces twenty times as numerous as were complained of before; till peace is made and schemes of ruinous economy are again called for by a new set of patriots. Thus the patriotic farce goes round, ending in a real tragedy to the nation and mankind."

It will be within the immediate recollection of every one, that when war broke out in 1854 with Russia, 10,000 men were ordered to Malta, and in order to make up the regiments composing this force, volunteers were called for from regiments remaining at home; shortly after 10,000 additional men were ordered to Turkey, when the regiments that had already parted with their best men were compelled to call for volunteers from the few regiments that were to be left at home, and to fill up their ranks with raw recruits. There was no reserve left. The men sent out to fill up the chasms caused by action and disease, and the regiments subsequently ordered to the Crimea, were, with one or two exceptions, nothing better than recruits, who were, to use the expression of Lord Raglan, "swept away like flies."

Such have been the results during a long course of years of the want of preparation for emergencies which characterised the policy that has been pursued with regard to the army, and it behoves us in the present disturbed state of Europe, and the uncertain position of our relations with foreign powers, to consider if some improvement could be introduced into our military system. It is therefore proposed to show,—

1st. That the nation can be attacked, and that the Channel can be bridged.

2nd. That the organization of the Army is defective, both in numerical amount and distribution.

3rd. That great improvements can be carried out in the distribution, recruiting, and instruction of the Army.

The Possibility of Invasion.

The formidable forces permanently at the disposal of the Emperor of the French, Cherbourg and its capacity for mischief, and the successful issue of the Emperor's rapid aggressive operations in Italy, having pro-

duced a salutary alarm and distrust, and confirmed the opinion of able officers, that the command of the Channel may be obtained by our warlike neighbours, and that it is possible, with a free sea, for 200,000 organised disciplined troops to effect a hostile landing on the assailable shores of England, the real and positive danger which may still continue to embarrass and beset us will be precisely comprehended by an attentive consideration of the note which General Buonaparte transmitted to the Directory, dated Paris, 13 April, 1798, "relating to the system of war that ought to be pursued against England."

Napoleon's Plan for Invasion in 1798.

From the following extract from this remarkable document, we may imagine the advice offered to the Directory has not altogether escaped the notice of Louis Napoleon.

"Dans notre position, nous devons faire à l'Angleterre une guerre sure, et nous le pouvons.

Que nous soyons en paix ou en guerre, il nous faut 40 ou 50 millions pour réorganiser notre marine.

Notre armée de terre n'en sera ni plus ni moins forte ; au lieu que la guerre oblige l'Angleterre à faire des preparatifs immenses qui ruinent ses finances, détruisent l'ésprit de commerce, et changent absolument la constitution et les mœurs de ce peuple.

Nous devons employer tout l'été à armer notre escadre de Brest, à faire exercer nos matelots dans la rade, à achever les vaisseaux qui sont en construction à Rochefort, à Lorient, et à Brest.

Si l'on met quelque activité dans ces travaux, nous pouvons espérer d'avoir au mois de Septembre trente-cinq vaisseaux à Brest, y compris les quatre ou cinq nouveaux que l'on peut construire à Lorient et à Rochefort.

Nous aurons vers la fin du mois, dans les différens ports de la Manche, près de 200 chaloupes canonnières. Il faut les placer à Cherbourg, au Havre, à Boulogne, à Dunkerque et à Ostende, et employer tout l'été à emmariner nos soldats.

En continuant à donner à la commission des côtes de la Manche 3 millions par mois, nous pouvons faire construire 200 autres chaloupes d'une dimensions plus forte, et propres à transporter des chevaux.

Nous aurions donc, au mois de Septembre, 400 chaloupes canonnières à Boulogne, et 35 vaisseaux de guerre à Brest. Les Hollandais peuvent également avoir dans cet intervalle 12 vaisseaux de guerre au Texel.

* * * * * * *

Il serait possible alors de transporter 40 mille hommes sur le point de l'Angleterre que l'on voudrait, évitant même un combat naval si l'ennemi était plus fort, tandis que 40 mille hommes menaceraient de partir sur les 400 chaloupes canonnières et autant des bateaux pêcheurs de Boulogne, et que l'escadre Hollandais, avec 10 mille hommes de transport, menacerait de se porter en Ecosse.

L'invasion en Angleterre, exécutée de cette manière, et dans le mois de Novembre et de Decembre, serait presque certaine.

L'Angleterre s'épuiserait par un effort immense et qui ne la garantirait pas de notre invasion."

Means of Resistance and Composition of our Forces.

The above may assist us, during this temporary lull, which is dependant on the management of Louis Napoleon, and before a peace establishment suited to the times may be determined on, in calculating the means and power of the nation to resist attack, in examining closely the composition of our forces, improving our military constitution, and in judging how far the defensive measures proposed are adequate to the supposed crisis. Commissions on our national defences have been appointed, forts and towers have been armed, positions for reserved arsenals have been selected,

every creek and accessible inlet has been repeatedly surveyed. The principal fortresses and dockyards are being extensively enlarged and improved. The Volunteer Rifle Movement has been enthusiastically and opportunely encouraged. The divisions, and brigades, and regiments are models of discipline, and are in themselves as perfect as they can be made by vigilant instruction, elementary drill, rifle practice, and incessant tactical display; but the battalions destined to bear the brunt, and to be first and foremost in the fight, and to give example and confidence when arranged and united to Militia, Yeomanry, and organised Rifle Volunteers; the troops by which the whole defensive machinery is to be brought into use and worked, are so deplorably below the mark in respect to numbers, that it is inconceivable in this age of reform, that the distribution and formative regimental organisation of the Infantry of the Line should not yet have been constituted on solid principles, applicable to every description of service, and embracing the ultimate purposes of depôts unembarrassed by provisional battalions, and the waste of force resulting from their restrictive duties.

The organic reforms to which we advert, and which we think necessary, could not fail to aid in planting firmly a precautionary system of defence, advancing the interior and exterior political interests of this country, and in sustaining without difficulty the required reliefs of corps in India.

Recruiting.

Voluntary enlistment, a mode of recruiting peculiarly suited to the British Army, and the only one adapted to our institutions, should be rendered so attractive, that it might be composed of the best of the working classes, and raised in character and usefulness far above any other European force.

Effect of the Military Constitution.

A military constitution found to be so ruinously defective, that it will not admit of extensive or important offensive operations being carried on, or the interests of colonies protected, without exposing the parent state to insult or invasion, must increase the public expenditure desired to be avoided by temporary arrangements necessarily sanctioned in such a case. The organisation of our Army constantly produces such results.

A Kaffir war draws a force from our shores not disposable, Russian menaces denude our colonies, and, the Crimean services terminated, a formidable mutiny requires that the Militia should suddenly be called out to replace the troops on passage to India. A more uneconomical system could not have been devised, or one more injuriously affecting the discipline of regiments, than that which it appears from the annual estimates will continue to be followed.

Impracticable as it would be to guard against such shocks as these, or to be prepared at all times for the calamitous consequences inseparable from the control and management of vast territorial acquisitions, yet the permanent forces of the empire might be augmented and distributed so judiciously, and adapted to a defensive position, quasi belligerent, that the endless excessive outlay created by transitions from inconsiderate and

absurd reductions to extraordinary exertion and exhausting efforts, and occasioned by raising new regiments and concentrating scattered troops for immediate action and unexpected warfare, might never be demanded.

Effect of the Depôt Battalion System. Proposed Organic Change.

The active battalions of the regular Army at home may be estimated at present at 29,800 rank and file; viz. 5,800 Foot Guards, 24,000 or 30 battalions of Infantry of the Line. To this slender statement may be added 24 depôt provisional battalions, amounting perhaps occasionally to 23,000 rank and file. These, however, from their construction and abrupt fluctuations in numbers and restrictive local duties can scarcely be called moveable for field service. They are in every respect inferior to service companies of regiments, and have not the advantages derived from *esprit de corps*. They are liable to an oppressive accumulation of the youngest of young officers, beyond the influential control of their own commanding officers, which must be unfavourable to strict discipline; they absorb nearly half the force of the Infantry of the Line stationed at home, in carrying on a preparatory and limited course of drill for recruits, to fit them for embarkation, which could be accomplished, and many other important objects secured, by adopting *permanently* the organic formation of regiments with two battalions, each applicable to unlimited service, *one* to be in its turn, as a general regulation, retained at home with the functions of a recruiting depôt, while the other is serving abroad, and both at the disposal of the War Department on urgent occasions.

It cannot be denied, however, that as a mere depôt for drilling and distributing recruits, and for the reception of soldiers whose cases will not admit of service abroad, the establishment of Provisional Depôt Battalions works smoothly, and the process of regulating reinforcements and drafts for embarkation and conveyance to colonial territories is carried on with wonderful continuity and exactitude. But although such depôts might be necessary for a large continental Army raised by conscription, the continuance of the existing depôt system would interfere with the efficiency of the Volunteer Regular Army.

The establishment of every regiment at home should be raised as soon as possible to 1,400 rank and file; and, on reaching that strength, divided into two battalions, and the system of two battalions gradually carried into effect as a permanent organization.

It has been computed, accurately we believe, that we are losing men at the rate of 11,000 a year by desertion—a loss to the country of at least 300,000*l.* per annum.

The whole bounty money given to recruits is a waste of nearly 200,000*l.* per annum, and the whole process of the system disgraceful. Under such circumstances it would be inexcusable in any war department tolerating a mode of raising recruits for our Army, without making every effort to obtain the abolition of a system, believed to be based on falsehood, and directly tending to immorality.

It has been proposed, we observe, in an augmentative memorandum originating in the War Department, to increase the soldier's pay, and to

place it to his credit when he receives his discharge, and to shorten his term of service; and that to meet the expenses of this increase of pay the public should be released from the following charges:

1. Reduction of the pension list altogether, except in a case of a wound.
2. The abolition of bounty.
3. The diminution of desertion, by which we are losing 11,000 men a year.

By these reforms and others, the public would gain, it is supposed, about 1,500,000*l.*; the increase proposed in the project to which we advert is one shilling per day, which, at the end of a certain term of service, would amount to a large sum, which sum the discharged soldier would be entitled to have paid to him unconditionally.

The whole proposed innovation is excellent in principle, but would not, we think, obtain the approbation required to carry it through as a financial measure. We entertain no doubt that a modified scheme might be most satisfactorily introduced, and completed with the same object, viz.:

Voluntary enlistment for ten years to be continued under a stipulated condition that every soldier, after serving with good conduct for that period, should be entitled to an annuity or pension, calculated on one shilling per diem, and also a gratuity, with the option of continuing his service for seven years more, and all bounties and other pensions to be discontinued.

We may quote some of the leading objections to the present recruiting system as specified in the memorandum to which we refer.

That we do not get men enough; we do not get men of the right sort; and those whom we do get, are not got in a satisfactory manner; they are generally speaking inveigled into enlisting; that it is possible not only to raise a sufficient number by voluntary recruitment, but to make the service so attractive that it will secure the best of the working classes.

It is certain that there are more valid objections to either increased bounty or increased pay than the public expense it would occasion. High bounty leads to desertion, and both one and the other lead to drunkenness and riotous living.

With the inducements proposed to be held out, and the opportunity of enabling a young man at an early age to work out his independance, it is supposed that the recruiting serjeant would soon lose his avocation, and that the difficulty would not be to entice, but to choose among candidates.

Necessary Strength of the Military Force (Infantry) for all Purposes.

At the outbreak in India, the whole of the European troops in the three Presidencies did not exceed 45,500, viz: 24,336 in Bengal; 10,720 in Madras; 10,430 in Bombay.

Whatever may be the force now required for India under present circumstances, we could not calculate on less than 55,000 Infantry of the Queen's Army, exclusive of European corps considered necessary to act with them, under the immediate command of the Governor-General, being retained in the Presidencies for the military occupation of the country, nor less than 24,000 men being required for garrisons abroad and the colonies; 73,000 Infantry of the Line should constitute the regular force, with 5,600 foot guards to be maintained for the defence of the United Kingdom and Ireland, and for reliefs in India. If these forces were organized and

distributed with ability and economy, it would place at the disposal of the Queen's Government about 145 battalions of the Line, exclusive of troops serving in India, for colonial and home service, at the expense of about 2,500,000*l.* from which would be deducted the charges to be paid by the East Indian Exchequer at about 20,000*l.* for the maintenance of two companies of each battalion of the fifty-five at home.

The results of this construction of the regiments of the Line would prove.

1st. That battalions in serving in the East Indies and distant colonies might be relieved every ten years punctually, and every six years in colonies nearer home.

2nd. That Volunteer Rifle Corps could be united and efficiently attached to 15 or 26 divisions, composed of soldiers of the regular Army.

3rd. That a sufficient force would always be ready to embark on any emergency for foreign service without being compelled to continue that practice, destructive to regimental discipline, of collecting volunteers from battalions that remain on home service.

With the improved means of transport to India, it would be very desirable that every battalion in India should be relieved when it should be found unfit for active service by sickness or loss in battle; and that every corps should be relieved after nine years' service in India. This system would prove less expensive than reinforcing corps continually with drafts of recruits.

With reference to the Army estimates, it should be borne in mind that in the charges brought forward this year are included alterations and improvements which should have been authorised many years ago. These have been occasioned by improvident reductions, neglect in fortifying dockyards and arsenals, building barracks, repairing and ventilating them since the value of a soldier's health has been understood, and for pensions to invalids discharged in garrisons of an army too limited for their work, and for new armies and armaments.

The commissariat and military train and medical departments have been resuscitated, and greatly improved barracks have been built.

Recapitulation of Advantages in Proposed Scheme.

"We get," says Mr. Sidney Herbert, "our men with *difficulty*, by every kind of cajoling and inducements we can devise, and in our necessity descend to those means which men do not have recourse to till they think all others are exhausted."

Could we imagine this detestable scheme of recruiting the ranks of the Army totally abolished, that young men of the labouring classes of 18 years were able to work out their independence in ten years, and that organic charges in the method of raising recruits had been effected;—

Could we imagine that all battalions at home were carefully distributed and fully occupied on garrison duty, or in the temporary barracks or encampments, or permanent barracks of instruction; and that in the drill season, *for four months*, but never more than *five*, were formed into corps d'armée, and assembled in encampments, as an established regulation; and tactically, strategically, and scientifically instructed and moved; could we imagine that when that tactical and strategical course had terminated,

and tents struck, the encampment would break up annually in October, and that their battalions would be marched to good permanent or temporary well-ventilated barracks, with drill grounds and ranges for rifle practice, and artillery practice if possible, where they would remain under the immediate command and careful instruction of their own commanding officers, and were inspected, but not too often, by their district brigadiers, or by colonels on the staff, and the recruits with this system carefully trained by elementary tactics for advanced service with their corps; and that every company were instructed in artillery practice, and as staff corps or sappers and miners are taught;—

Could we imagine that all officers appointed to their first commissions, after their examination, were, by this revised system proposed, ordered and compelled to join their *battalions at home* (which should be designated reserved battalions to distinguish them from battalions abroad), and required to go through a course of instruction, before they could succeed to a lieutenantcy, which would qualify them for their duties as regimental officers, and to hold staff situations, in fact to complete their military education under able professors; and that mathematical masters and professors of fortification and drawing masters were attached to each corps at home, or to each district, and that young officers were kept steadily at work under them, and with practical instruction also, turned out and reported tolerable engineers and artillerists after being closely and constantly employed for a year or eighteen months, and that able and accomplished staff college officers, and officers of artillery and engineers who could not find active employment were offered the appointments of instructors;—

Could we imagine that young officers thus educated, and indeed all regimental officers, were to pass an examination for a degree at Sandhurst, and that their examinations were recorded if successful, and noted for promotion by staff employment, and that by this system the military authorities and active general officers employed could have the widest field possible from which officers could be selected for the staff, instead of receiving them from any special staff corps, composed probably of accomplished officers and first-rate disciplinarians, but without military qualification requisite to entitle them to join the staff of an army at the commencement of the operations of an active campaign;—

We would exclaim enthusiastically, could we imagine these essential reforms and revisions effected, that the realization of such benefit to the army would confer lasting honour on the country, and raise the profession and character of a British soldier so highly, that no sum in the annual estimates would be considered extravagant to perfect the beneficial arrangements recommended for adoption.

Primary Examination.

While we endeavour to bring under patient discussion the important questions to which these observations refer, the subject of primary examination for commissions established on the principles recommended by the Duke of Wellington, and of military education and professional training, to which Mr. Sidney Herbert directed the attention of Government in his speech of 5th of June, 1857, since published with an

appendix, are of such intense interest, that we cannot refrain from offering on opinion that no opportunity should be lost in giving them most attentive consideration.

If the test for admission to the Army were so modified and regulated that candidates would never be hurried from a public school, half educated, to be forced through the process of cramming, but limited to examination prescribed as indispensible and preparatory, to enable them to commence an educational course strictly professional and mathematical the moment they joined their respective reserve battalions at home, their appointments to their first commisions would be free from the difficulties and objections which many officers have noticed who have devoted their time to this question. The second examination at present directed by the Regulations comprehends merely a summary of routine regimental duties, which, in every regiment well composed and commanded, was always insisted on.

But it may be inferred, from the remarks of Mr. Sidney Herbert, that he attributes our reverses in war to a military system unaided by a sound practical education for officers, to executive tactical errors, rather than to ill-considered plans and strategical combinations. Whatever reliance may be placed in these assertions, we are much indebted to him for his continual exertions on behalf of the soldier, and for stimulating the Government to raise the character of the British Army. Every officer will be interested in the great work of introducing a beneficial and extensive system of instruction, and ardently desire that it should be carried further even in detail and method than he has suggested; so that all intelligent officers desirous of improving themselves should have every encouragement and the best opportunity of qualifying themselves to hold staff appointments; and that none should be exempted or excluded from the course proposed to be established.

The grand objects to attain are to get rid of *for ever* the dissolute and idle habits and want of occupation and full employment at depôts, and to change altogether the constitution in regard to "tactique elementaire et grand tactique." Compare the routine depôt system with the activity which would prevail if this new school instruction once opened, where would be studied under able professors, energetically supported by commanding officers—*practical* mechanics, military drawing, sketching, surveying on the ground, sappers and miners, gunnery, throwing up forts, works, pontooning, military topography, reports on roads, and on ground for military positions. Reconnaissances, including an inquiry and report of the resources of the country. Contemplate the beneficial change in prospect which would form a perfect soldier. Habitually accustomed to every kind of military labour, obedient, disciplined, and convert him into a useful civilian after he had reached the independence at an early age to which he would be entitled by the new system of recruiting.

In continental armies, the previous education of officers adopted at military institutions has seldom been found to qualify them properly for the staff.

The military constitution which is advocated in this paper would more contribute to develope the pretensions and qualifications of officers for high and confidential employment than any other system.

We find that the situation of Brigade Major is always filled by able and active officers, in every respect fit for the duties they have to discharge, because they are selected generally by commanding officers, under whose vigilant inspection they have risen to a certain rank, and established a character in their regiments. It was asserted by a general of great reputation that *fighting, and a good deal of it*, could only make good officers. This, to some extent, may be received as an axiom; we must, however, consult *Guibert*, who persuades us that great generals are rarely to be made or found, and to conclude that none of the capacity described by him can start up in one campaign.

"C'est une encyclopédie, elle seule, que la science militaire. C'est le plus interessante des sciences, soit qu'on la considère relativement à la variété de ses détails, ou à l'importance de son objet, ou la gloire et aux grands intérêts qui y tiennent. Puisse cette vérité, sentié par les hommes qui sont destinés à commander les armées, leur faire appercevoir l'immensité de leurs obligations! Car ce n'est encore rien, que l'acquisition des connaissances qui composent la science militaire; il faut, pour être un général du premier ordre, savoir employer ces connaissances; il faut avoir le génie que rien ne peut acquérir, le coup-d'œil que l'habitude perfectionne et ne peut donner; il faut réunir un assemblage plus qu' humain de qualités physiques et morales. Aussi doit-on rester confondu d'étonnement et de respect, à la vue de petit nombre de generaux que le posterité honore du nom de grand. Il semble que le nature ne les produise çà et là, au milieu des siecles, que pour servir d'epoques à la grandeur de l'esprit humain."

Hygienne.

With respect to the Hygienne Statistics of Mr. Sidney Herbert they may be correct, but few officers will concur with him when comparing mortality connected with different avocations, that either food, bad cookery, clothing, or ill-ventilated barracks are the *chief* causes of the excessive mortality of the soldiers of the Guards and Line.

A young lad of the Guards probably is on guard twice a-week, and on sentry two hours at a time, four times in the twenty-four hours; and after being exposed to the weather and the currents of the avenues of St. James's returns to a hot guard-room, throwing himself with his damp clothes on a guard-room bed. It is this kind of work, and the want of continuous uninterrupted sleep, the temptations of a capital, habitual inebriety, in fact, the life of a soldier, night duty, and inadequate garrisons, that destroy our soldiers and increase the Pension List.

Barracks are too crowded, and seldom sufficiently ventilated; but the rooms and cottages of our labouring classes are poisonous, in consequence of defective ventilation and cleanliness, in comparison with Barrack accommodation.

The wear and tear of the constitution of the Metropolitan Police do not support the conclusions arrived at in the statistics to which we allude. The stout well-fed Policeman takes his eight hours walk, has ten hours off duty, and a comfortable home ready for his reception when relieved. Positive and accurate information relative to the averages of mortality, and causes of discharges in regiments of the Line, must be difficult to procure. Rapid embarkation, unhealthy stations, and the consequent ill-health, and discharges from the effects of a disease *unnoticed* in the controversial and statistical details lately produced, defy all calculations of the

Actuary, and the great increase also in the list of discharged, narrow-breasted, ill-formed young soldiers incautiously enlisted from the Militia.

Militia.

The Enrolled English Militia may be stated at 60,000, but not more than 20,000 of this number can be calculated on as an effective force when called out. Unsound and defective as the Militia system is, it might become less objectionable by discontinuing to enlist for the Line when a corps is embodied and called out for permanent duty, and when a regiment has attained a fair state of discipline. If called out for drill, or for inspection, the men might be allowed to volunteer, at any time, with the sanction of their Colonel, while regiments remained disembodied.

Expense.

It might not be thought possible to commence, at this time, with reference to the Navy and Army estimates of this year, the projected reconstruction of regiments of the Line, and the organic change in recruiting which is to attract to the Army the best description of recruits. We have no doubt, however, that these beneficial and necessary measures might be carried into effect *immediately*, without an outlay beyond that included in the estimate of this year; and that, brought forward with the support and concurrence of the Secretary of State for the War Department, and the Commander-in-Chief of the Queen's Army, the Service would derive from them more advantage than from any of the boons which have recently been conferred by their intervention and exertions.

Evening Meeting.

January 30th, 1860.

W. STIRLING LACON, Esq., in the Chair.

NAMES of MEMBERS who have joined the INSTITUTION since 1st January, 1860.

LIFE.

Somerset, His Grace the Duke of, First Lord of the Admiralty

Layard, C. E., Lieut. 15th Regt.

ANNUAL.

Davies, John, Captain R.N.
Lee, Mainwaring C. W., Lieut. Coldm. Gds.
Buckland, F. T., Asst. Surg. 2nd Life Guards, M.A.
Mayne, Richard C., Lieut. R.N.
Howison, Young Howison, Surg. M.D., Royal Hospital, Chelsea
Leahy, Arthur, Bt. Major R.E.
Doull, Alexander, Lieut. R.A.
Kirk, James B., Capt. 96th Regt. Brigade Major, Devonport
German, James, Capt. 3rd Rl. Lancash. Mil.
Plasket, W. A. H., Lieut. 24th Regt.
Drummond, Edgar A., Lieut. late R.N.
McLaughlin, E., Lieut. Royal Artillery
Porter, Whitworth, Major R.E.
Duff, James, Bt. Major late 23rd R. W. Fus.
Hay, Graham, Capt. 62nd Regiment
Wyatt, John, Asst. Surg. Coldstrm. Guards
Bannister, C. W., Major 2nd Bom. Light Cavalry
Longmore, Thos., Dep. Insp. Gen. of Hosps.
Smith, H. Fowler, M.D., Staff Surgeon
Lemon, Thos., Col. C.B. Roy. Marine Lt. Inf.
Sladen, Joseph, Lieut. Royal Artillery
Chamberlain, W. C., Capt. Royal Navy
Windus, A. J., Lieut. H. M. Indian Navy
Norman, C. W. J., Major 72nd Highlanders
Roberts, C. P., Lieut. Bom. Horse Artillery
Ind, F. J. N., Capt. 37th Regt.
Gourley, de la Chernon, Asst. Surg. late H.E.I.C.
Grant, J. W., Surg. ret. Beng. Army
Minchen, F. C., Lt.-Col. H.M. Indian Army
Dundas, Thos., Capt. 12th Regt.
Rough, Wm. H., Capt. H. A. Company
Gould, T. T., Lieut. 13th Light Infantry
Jones, Geo. Captain, late Mon. Mil.

PRESENTS.

Library.

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Photographs and Prints of the Monuments to Col. Chester, 23rd B.L.I.; 51st Regt.; 7th Fusiliers, 2 Plates; 49th Regt.; 31st Regt., 2 Plates; 33rd Regt.; 1st Bombay Fusiliers. Colonel Mignon. Major Broadfoot. General Sir Robt. Dick, 2nd Battalion Military Train; 23rd Regt.; 16th Lancers. 2 Knights Templar. *Presented by E. Richardson, Esq.*

Fourteen Stereoscopic Slides of the Franklin Relics. 1 large Photograph of "The Record" in the Museum of the Royal United Service Institution. *Presented by Lieut. Cheyne, R.N.*

MUSEUM.

Military.

Elongated Rifle Bullet, with Cork Belt. Steel Rifle Bolt, with Wooden Jacket. *Presented by Capt. J. Norton.*

Naval.

Model of Native Indian Boat with Outrigger. *Presented by J. Barrow, Esq., F.R.S.*

Miscellaneous.

Copper Shell for Musket, found at Bomarsund. *Presented by Lieut. J. W. Pike, R.N.*

Flag used by the Crew of H.M.S. Niger when they opposed the Mutineers at Sheerness in 1797, and presented by them to their Captain, Ed. James Foote. *Presented by Admiral Stanhope, in the name of his wife, daughter of the late Vice-Admiral Sir Ed. Jas. Foote, K.C.B.*

Medal issued for Services in India between 1799 and 1826. *Presented by the Secretary of State for India.*

TENTS.

Invented by himself.

By Mr. George Turner.

In instituting the improvements which I flatter myself I have effected in tent construction, my greatest desire has been that they may lead to a considerable change in the system of encampment, and be the means of removing much of the hardships hitherto incidental to a campaign, and of improving generally the sanitary condition of the soldier in the field. Of all the causes tending to weaken the effective force of an army, disease is the most formidable, and nothing extends and strengthens its ravages more than wet nightly lodging, bad ventilation, or insufficient shelter from the inclemency of the weather.

And in respect to the wounded or the sick, it is a notable fact that there is no assistance the skill of the surgeon can receive in promoting a cure, equal to enabling his patients to breathe a pure air and affording them the comforts necessary to their condition.

Canvas constructions of the ordinary kind mostly fail when their services are required, viz. in wet, stormy, and inclement weather, and the tents and marquees used by the British Army in the Crimea may fairly be classed amongst the worst of the kind.

No event of the present day has stirred the public feeling to so great an extent as the ever to be regretted sufferings and decimation of those gallant soldiers composing the British Contingent in the late Crimean campaign—sufferings which called forth feelings of sympathy from every breast, and were characterised by Lord John Russell, in the House of Commons, as being truly heartrending and afflicting.

To those who watched the progress of that war, and read the interesting letters of the correspondents of "The Times," and other journals, and the letters from officers and others, published at the time, it must be evident that most of those disasters were traceable to the wretched shelter afforded to the troops by the old regulation "Tents," and to the inadequacy of the means provided for alleviating the sufferings of those disabled by wounds or sickness.

The following are selections from many of the statements which have appeared in the public prints on the subject.

Mr. Russell, in his correspondence, remarked that on the 14th November,

"A fearful hurricane passed over the camp; all the tents were blown down, and the "men exposed to cold, rain, and hunger for the day.

"Last night it blew cold and fierce, rain and sleet fell in torrents, and many tents were "blown down in camp; I need not say that those who were suddenly exposed to the "violence of the elements were in a very sorry plight indeed.

"A bed with a lively little sewer intersecting it, is not the most agreeable thing in "winter time.

"The beggar who wanders about the streets of London in the rain leads the life of a "prince compared with the British soldiers who are fighting out here for their country.

"They have no shelter, no rest, and no defence against the weather; the tents let the "rain through like sieves, and are perfectly useless as protections against the weather.

"Think what a tent must be, pitched as it were at the bottom of a marsh, into which "some twelve or fourteen miserable creatures, drenched to the skin, have to creep for "shelter, after twelve hours vigil in a trench like a canal, and reflect what state these "poor fellows must be in at the end of a night and a day spent in such shelter, huddled "together without any change of clothing, and lying packed up as close as they can stow "themselves in saturated blankets.

"Men have been frozen in their tents.

"The camp was visited by a hurricane to-day. The whole head-quarters camp was "beaten flat to the earth, and the unhappy occupants were rushing through the mud in "all directions, in chase of their effects and clothes.

"Our fine patent stoves are wretched affairs. They are made of thin sheet iron, which "cannot stand our fuel; besides, with charcoal they are mere poison manufactories, and "they cannot be left alight in the tent at night.

"The cold is developing itself, and I regret to say our efforts to guard against it have "been attended with mischief. Captain Swinton, of the Royal Artillery, was found dead "in his tent, suffocated by the fumes of charcoal from a stove, which he had placed within "it for the purpose of warmth.

"Lieut. Ramsbottom, of the 97th Regiment, was found dead from suffocation by char-"coal. He had come from duty in the trenches, and had closed his tent and laid down "for a few hours.

"Although the tents stood, they flapped about so much, and admitted such quantities "of snow, rain, and filth from outside, that it was quite out of the question to sleep in "them. Our general's marquees were as incapable of resisting the hurricane as the bell "tents of the common soldiers.

"We hear that the hospital tents are all down, and that the sick have had to share the "fate of the healthiest and most robust.

"There are 20 cases of frost-bite out of 125 patients brought by the Melbourne. The "greatest number of these patients affirm that the frost-bite came on while they were lying "sick of some other disease in the temporary hospital huts and marquees."

A correspondent of "The News of the World," after sundry remarks upon the weather, observed—

"It has also rained hard, completely swamping some of the tents, and the hospital of "the Grenadier Guards was inundated to such an extent that the men were obliged to be "moved out of it. The deaths are increasing frightfully. The daily average is now "seventy. Literally speaking, the men perish from cold and want of shelter."

An officer of the 2nd Royals, writing to the "Times," stated—

"January and February, with part of March, are very bad, and the cold will be most "intense. What we shall do in our tents I know not; we cannot make huts, as there is "no wood. In the cold and damp tents it will be miserable. The tents all leak, and the "men are lying 15 together in a place where no English gentleman would put his pigs."

An army surgeon, writing also to the "Times," soon after Inkerman, observed—

"Our tents were blown down lately, and deaths from exposure, rain, snow, and sleet "took place. We could light no fires, and for 48 hours were in a terrible plight."

And the Hon. Captain Maxwell, of the 50th Regiment, in a letter to his brother, Lord Farnham, made the remark—

"I shall never forget the suffering I endured for five or six days, in a miserable, cold, "wet tent, with nothing but the ground to rest upon, and two blankets to cover me."

The foregoing are but a few of the many complaints made upon the subject, and it was in consequence of reading some of the earliest of those accounts that appeared in the press, that I first committed myself to the task of remedying such glaring defects.

Many years of the early part of my life have been spent at sea. A great portion of time passed among the natives of the Islands of the South Pacific at New Caledonia, Erromanga, Tanna, the Society and other groups, gave me many opportunities of observing the practices of savage life, and fitted me in a great measure for the task I entered upon.

A careful observation of the subject soon convinced me that the tents and marquees were wanting in the following particulars, viz.: *Stability*, a proper system of *Ventilation*, impermeability to *Wet*, means of sleeping the men off the ground out of the mud and mire, and a practical plan of fitting stoves for fires, to guard against *Frost Bite*, and yet not to affect the inmates by the *Smoke* and other *poisonous exhalations*.

Some deep thought was requisite, in order to combine so many advantages, without making a tent too cumbersome an article to be portable. A few hours' consideration however gave me the key to the whole; and how far my efforts have been successful, and in what way I have effected the improvements requisite, may be seen by the following brief particulars, and the appended reports of the *officers* who have had the *direction* of the *trials* of my *tents* at *Aldershot* and *Chatham*, as well as by the *statements* of the *Press* in *their favour*.

These improvements, I believe, comprise all that can be desired in habitations of this nature, and are classed as follows:—

1st. *Stability*, which is obtained by an improvement in the construction and arrangement of the framing and ground fastenings. The stays or framing which support the covers of the tents are of galvanised wire cord, and are adjusted to a metal collar through which the pole or support is inserted, and from which they lead to the ground. Each stay or cord is secured to an improved peg or fastening which is simple, strong, and light. I have different descriptions of pegs adapted for either soft or stony ground (figs. 1, 2); but those in use at the trials my tents have latterly undergone were made of rod iron, and consisted of one turn of a screw at the bottom of a shank. These screw-pegs can be easily repaired or replaced by an ordinary smith in case of damage or loss, if spare ones are not in reserve. They screw into the ground without disturbing the surface, but should the surface soil be too light to afford proper holding power, they can be screwed down until firm holding is obtained.

Fig. 1.—Screw Peg Fastening for Tents & Marquees.

Fig. 2.—Driving PegFastening for Tents and Marquees.

As they enter the soil without noise, their use for guard or outpost tents would be advantageous, as a tent could be pitched to shelter an outlying picket at night, close to an enemy's videttes, without attracting attention, an impossibility with the wooden peg, which requires driving with a mallet.

They vary from 9 to 12 inches in length, and weigh from 12 to 16 ounces, the smallest one when screwed has borne a strain of 830lbs. before drawing out of the ground, and a tent can thus be so firmly

secured that no wind will affect it, neither would any accumulation of snow upon the roof be likely to break it in. The wire cord used for stays is about $\frac{3}{16}$ths of an inch in diameter, and, being extremely pliable, can be spliced or knotted the same as hempen cord. Although it weighs but half an ounce per foot, it requires a strain of 600lbs. to break it, and will last for several years in constant wear.

When stowed, the stays fold up with the roof without fear of derangement or injury, and but very slightly increasing its bulk as a package.

The arrangements for suspending hammocks or cots by means of struts or rods, according to my plans, add considerably to the strength and stability of the tent, as, when the hammocks or cots are down and in use, the weights all tend to a common centre, and remove the strain from the pegs or fastenings.

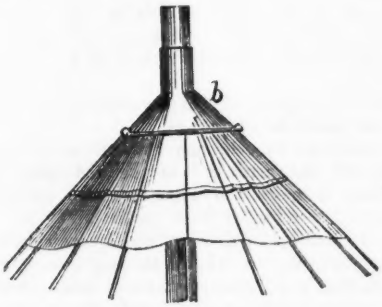


Fig. 3.—Top of Tent on enlarged scale, showing Ventilator. (*b*) Ventilator closed.

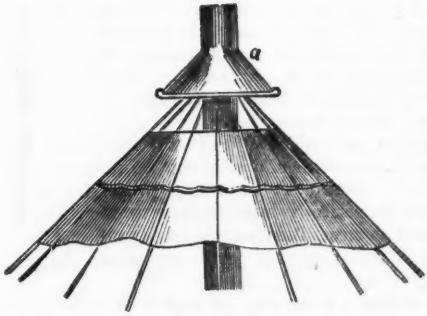


Fig. 4.—Top of Tent on enlarged scale, showing Ventilator. (*a*) Ventilator open.

2nd. *Improvement in Ventilation.*—This is effected by a very simple arrangement. An aperture is left in the top of the roof, immediately around the pole or tube. A hood or cover is fitted above it, and can be raised or lowered at pleasure by a simple pulley (see figs. 3, 4); the aperture is thus protected from the pressure of the external air, and the temperature of a tent or marquee placed under most perfect control, the simplicity preventing any fear of derangement to the apparatus. The hoods are of a description adapted to the shape of the roof; they are easily adjusted, and, when out of use, fold up and stow away with the covering. No system of ventilation can be perfect that does not protect the aperture from the pressure of the external air, and the aperture must be capable of being increased or diminished at pleasure, so as to regulate the temperature according to the climate.

The perfect ventilation obtained in these tents will be apparent from the register of the thermometer, as taken at Fort Vincennes, Paris, in June 1857, during a trial of my tents against the best used in the French Army. A thermometer was placed on the pole of each tent, and the following is one day's register of the same, commencing at midnight on the 9th, and ending at midnight on the 10th, viz.:—

Time.	My Tents. Degrees Fahrt.	French Tents. Degrees Fahrt.
Midnight 9th	70	64½
3 A.M.	68	63
6 „	68	66
9 „	70	79½
Noon	70	79
3 P.M.	64½	71½
6 „	62½	64½
9 „	61	62½
Midnight 10th	66	61½

This statement proves that my tent was warmer at night and cooler in the day-time when the sun was out than the French tent, and could have been made cooler by day had such been required, as the ventilator was nearly closed. The French tent, on the contrary, had no means of regulating the temperature.

In hot countries, ventilation may be further assisted by raising the curtain or wall of a tent, either partially or wholly, thereby giving free admission to the air, and effectually dispersing all damp and noxious vapours. The doorway is also a great advantage in ventilating my tent. This is effected by raising the lower portion of one of the gores or sections of the roof, which not only admits the air freely, but acts as an awning to the entrance, and screens it effectually both from sun and rain. Again, by tricing the hammocks close up to the top of the tent, they touch each other, and form an air-chamber between them and the roof, which entirely excludes the heat of the sun, and renders the interior quite cool; the curtains can also be kept up at night, if necessary, without fear of draughts or other inconvenience.

3rd. *Waterproof material for the roofing of tents and marquees.*—This is composed of mineralized india-rubber double-texture fabrics. The mineralizing process destroys the tacky or sticky properties of the india rubber, and renders it perfectly impermeable to moisture, &c. Being proofed at about 300 degrees, it is unaffected by either heat or cold; any damage to this material by shot or otherwise can easily be repaired in a few minutes.

As well as sewing, the seams are secured by means of light rivets, which add greatly to their strength. Besides its waterproof qualities, the material is opaque, and one great annoyance in an Indian climate, the dazzling light occasioned by the sun's rays penetrating the ordinary duck coverings, would be removed.

The curtains or walls are of light cotton canvas or duck, and depend directly from the roof to the ground (fig. 5), the height varying from

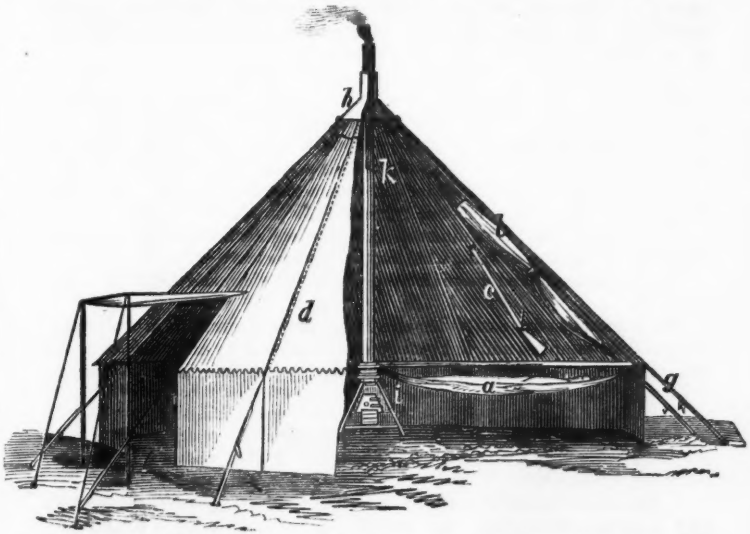


FIG. 5.—Tent, fitted with Hammocks and Fireplace. (*a*) Hammock as in use; (*b* Hammock as stowed, when out of use; (*c*) Method of stowing Musket; (*d*) Cover of Roof; (*e*) Curtain to do.; (*f*) Door open to the full extent; (*g*) Tent Lines; (*h*) Ventilator; (*i*) Fireplace; (*k*) Tube forming Flue to do., and support to Tent.

three feet in tents to six feet in marquees, and are fitted either permanently, or laced to the roof. The height of the wall allows a man to stand upright at a greater distance from the pole in my tents than in the present ordnance tents, whilst in my marquee a man can stand upright close to the wall.

Common canvas or any other material can be used for roofing if preferred, but it has the disadvantage of not being waterproof, and of becoming much heavier for transport when wet, which causes an increase in weight of about 75 per cent.

The way in which the roofing is adjusted and secured to the framework prevents the unpleasant flapping motion so common in the old tents and marquees in boisterous weather, and draughts are also so effectually excluded that a candle will burn under them as steadily as in a room. The material of the roofing may be preserved from rot or mildew in case of being packed in a damp state.

4th. *Sleeping accommodation for troops and others off the ground without the use of bedsteads.*—This most desirable and important advantage is attained by suspending hammocks or cots by means of light wooden struts or rods, one end being attached to a loop or eye fitted to the wire rope stays, and

the other hooking on to a flange fitted at a convenient distance from the bottom of the pole or chimney tube, whichever is used (see fig. 5).

My tents lately tested at Chatham and Aldershott were fitted with eighteen hammocks, and the framing of the tents have been proved capable of supporting continually that number of men, averaging from 24 to 26 cwt.

The hammocks are disposed radially around the pole, and when in use, are from 12 to 18 inches from the ground. During the day they are drawn close up to the roof, leaving the area of the tent quite free.

Should the hammocks on one side only be in use at one time, the stability of the tent is but little affected, as a test lately made proved that not more than an inch of deflection was perceptible in the pole. The weight, however, should be equally distributed around the pole.

A tent can be fitted with nine cots in lieu of eighteen hammocks, each cot requiring two struts or rods, whereas the hammocks requires but one.

The cots are adapted more for the use of the sick, and for officers and civilians.

The hammocks are easily detached from the tents, and form ambulance litters of the simplest and lightest construction, and by their use two men can easily carry another off the field (fig. 6). A belt is fitted over the

FIG. 6.—Hammocks in use as Ambulance Litters; two Men carrying one.

shoulder, having an eye into which the hook of the strut is inserted, and they are thus enabled to carry the weight with ease (fig. 7). In a hot sun, the wounded men may be sheltered from its rays by a light covering being placed over the pole, and air would be admitted freely at the ends.

FIG. 7.—Belt for carrying Ambulance Litters.

A very important feature in this method is, that the bearers are not only able to carry their rifles with them when so employed, but can use them, if surprised, without placing their burden on the ground, the arms being left entirely free.

In case of emergency, a lower tier of men can sleep upon the ground, according to the method at present adopted, thus enabling a tent to accommodate nearly a double number of men.

5th. *Warming a tent or marquee*, without subjecting its occupants to the deleterious and often fatal influences experienced by the ordinary method of placing a stove containing charcoal or wooden embers in the tent.

I effect this by making the flue of the fireplace the support of the roof, in lieu of a wooden pole, by which means the smoke and poisonous gases are effectually carried off, but a wooden pole can be used, if desired, to save weight, as they can be shifted from one to the other in a few minutes at pleasure (figs. 8, 9).

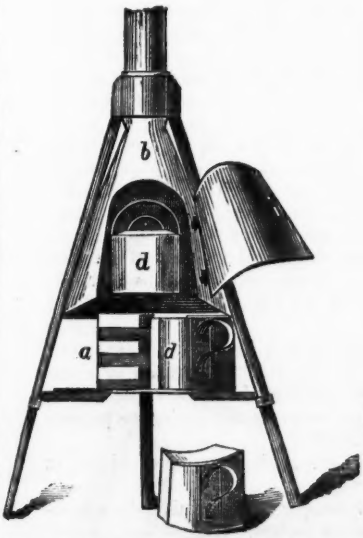


FIG. 8.—Fireplace as fitted to Tents, made to take to pieces. (*a*) Fireplace; (*b*) Hood over do., Door open; (*c*) Stand for Fireplace and Saucepans, and Stay for Legs; (*d*) Saucepans.

FIG. 9.—Another method of fitting Stoves to Tents, &c.; Tube supported on Tripod; Stove connected with Elbow Joint.

The fireplace is of a light and simple construction, and will burn any kind of fuel, even grass or roots. It throws its heat equally to all parts of the tent or marquee, and is adapted for cooking as well as heating purposes.

In a trial recently made with a fire of wood only, the temperature of a tent was increased 25 degrees in 30 minutes from the time of lighting.

When packed for use the stove and chimney tube occupy less space than a wooden pole, each tube being arranged so that one part stows into the other, making a compact parcel of about a third its entire length; the stove, as well as the hood for conducting the smoke into the chimney, fold together into a very compact and small parcel.

The fire can be used at night without endangering the tent or hammocks, thereby keeping the interior perfectly warm and dry in the coldest and dampest weather.

Any description of stove can be fitted to the chimney tubes, and more than one stove to a marquee if necessary.

6th. *Durability.*—My method of fitting wire-rope stays to support the roofing of tents and marquees affords a framework for the covers to rest upon. The coverings spread evenly and smoothly thereon, and all stress from the pressure of the wind is completely removed, the strain being borne by the stays. This adds greatly to the durability of the material, as the principal cause of tent covers tearing so frequently results from the canvas forming the only support to the poles, in which case it has to bear the whole strain and pressure of the wind. The wire stays or framing can be fitted to other covers when the first are worn out, as the wire cord is calculated to last for many years.

Though more expensive in the first cost, my tents and marquees will be found more economical in the end than those in present use, on account of their great durability.

7th. *Stowing fire-arms.*—Each tent is fitted with appliances for the stowage of the fire-arms and accoutrements of the men, by which means they are kept dry and ready to hand, in case of sudden alarm (see fig. 5).

Comparison of weight and stowage between the present pattern of Ordnance tents and marquees and those of my own construction.—The Government tent weighs 65½ lbs. when dry, and has a cubical capacity of interior, when pitched, equal to 512 cubic feet, or at the rate of 5½ lbs. and 42½ cubic feet per man. This tent is about 13 feet diameter, and 10 feet 3 inches high.

My own tent of 16 feet diameter and 10 feet high, with a stout duck roof, weighs about 100 lbs., and contains an internal capacity of about 900 cubic feet, being for 18 men, the number the tent is adapted for, about the same weight and capacity per man as the Ordnance pattern. The bulk, when packed, being also identical.

If fitted with the waterproof material for roofing, an increased weight of about ¼ lb. per man would be the result.

The hammocks and fittings weigh 7 lbs. per man, and the whole number for one tent occupies 6 cubic feet when packed.

If fitted with stoves, the extra weight will be 3 lbs. per man.

The hospital marquee used by the army at the present time is 29 feet long and 14½ feet wide. Its weight, when dry, varies from 428 to 507 lbs., and contains about 3,300 cubic feet of air.

A marquee of my construction, of the same size and internal capacity, fitted with a waterproof roof and lined throughout, would weigh but 340 lbs. fitted complete with all my improvements except stoves, each of which would add about 80 lbs. to the weight.

The bulk of the Government marquee packed is 26 cubic feet, against mine of 16 feet, the difference being on an average about 120 lbs. in weight, without stoves, and 10 cubic feet in bulk, and the larger the construction the greater will be the saving of weight in my marquees.

The following extract from the Report of Sir John McNeill and Colonel Tulloch will prove that marquees are highly essential for field hospitals:—

"The circular tent used in the British Army, which is calculated to contain 15 men, is altogether unsuited for an hospital in any climate. It affords very insufficient protection against cold, or rain, or heat. When there is much wind in wet weather, the rain beats through the canvas; and when it blows upon the door, which is continually opened for ingress and egress, the rain is driven to all parts of the tent. The pole being in two pieces for convenience of carriage, is weak at the joint, and in stormy weather is apt to give way. The side wall is too low to admit of the use of any kind of cot, if there be more than two or three men in the tent; the space is too confined to admit of proper attendance on the patients, even by the medical officer; and it is impossible, with safety, to use a stove or other means of warming it. In short, whatever may be the supposed advantages that have led to its adoption as a barrack tent, it would be difficult to contrive anything much more unfit for the accommodation of the sick."

As a general field hospital, I beg to offer a novel and peculiar adaptation of my system, by means of which six to eight marquees may be made to branch off from a common centre, in the form of a star, thus embracing a number of wards, in connexion with, yet distinct from, each other, while the part at the centre forms a place for the meeting of the medical men, the duties of the apothecary, and for surgical operations, out of view of the patients. At the same time, the whole of the wings of the wards will be under the eye of the attendants. A construction of this nature, with six wings, each 60 feet long by 16 feet wide, would afford accommodation for beds, and possess ample means for warmth and ventilation, and effect a great saving in weight over the same number of marquees containing equal accommodation, if fitted separately.

My hospital bedsteads fold up into a compass 2 feet 3 inches by 3 feet and 2 inches deep, and are fitted with a shelf at the headpiece, which will be found an important adjunct, as the patient can have his medicines or food close at hand, and thus help himself in the absence of an orderly or nurse. They are very strong and yet of light weight.

For the want of tables for surgical operations in the Crimea, many a poor fellow suffered severely during amputation. The tables which I have designed for my hospital marquees, although specifically designed for surgical purposes, are equally adapted for other uses. They are light, without sacrifice of strength, and, being fitted to connect in their several parts, are immediately available for use.

The oven designed by me for camp use (forming also a case for storing saucepans, &c.), answers equally as a boiler or stewpan, and must be used outside the tent, and separately from the stove. It is composed of two cylinders, one within the other, leaving an air chamber or space between them: in use it has proved to be most efficient, and will roast coffee, bake bread or any kind of food, in the shortest possible time, without fear of burning, as the inner cylinder is heated by the hot air in the chamber, and has a ventilator affixed at the top to regulate the heat. The manner of using it is a modification of the method of cooking practised by the natives of the South Sea Islands: a shallow hole being dug in the ground, and the bottom paved with stones or bricks, roughly laid, a fire is to be made upon them of any brushwood or rubbish that that can be obtained,

and when it has subsided to an ember, the oven is to be placed over it, and its sides banked up with earth to keep in the heat, a small hole being left on either side for vent. In ten to fifteen minutes the oven will be fit for use. A piece of beef, 16 lbs. weight, has been baked by this means in two hours, and potatoes in twenty to twenty-five minutes. This does away with the constant boiling so loudly complained of, and enables the soldier to vary his meals by an occasional baked joint, hash, or stew. At Chatham, a leg of mutton of 12 lbs. weight was cooked for the serjeant's mess of 3rd Depôt Battalion in one hour and ten minutes.

The theory of encampments involves no question second in importance to that of sheltering the troops. Sent forth to fight our battles, they have surely a right to expect that, on the score of humanity alone, the greatest ingenuity will be exerted to devise means of preserving them in health and strength; but, independently of the promptings of humanity, the necessity of economizing the resources and preserving untarnished the military reputation of the nation must be held by every patriotic and enlightened mind as constituting the strongest motive for preserving those who are willing to devote their lives to their country's defence.

Man's nature and constitution will not permit him long to endure exposure with impunity; and it is a mistaken notion to imagine that soldiers can fight battles and bivouac any length of time without proper shelter from the weather. All soldiers suffer sufficiently during a campaign from other and irremediable causes, but to oblige them to seek repose frequently in wet clothing and lying on wet ground in inclement weather is certainly fatal to health and life; and the military history of Europe affords numerous examples of the folly of the practice.

Mr. Russell, when writing on the subject, has observed that "the "cheapest, wisest, and most humane plan, unquestionably, is to spend money "on the soldier; to supply him abundantly, keep him warm, and feed him "well, of course without pampering him, or accustoming him to luxuries.

"The British soldier is too valuable an article, and too difficult to "replace, to be allowed to perish for want of due provision for his health "and comfort. What would we not give to get back those battalions of "well-trained veterans who perished in the mud and misery of last winter! "Such soldiers are not to be replaced for years; and recruits, however "strong of heart and arm, cannot fill the void left by men who have been "long under the colours."

"The Times" in its columns, under date of the 19th June, 1856, when writing upon the war in the Crimea, made the statement, that "20,000 men died of disease, cold, hunger, and nakedness, and such ordinary causes, whilst less than a fifth of that number were killed by the enemy," and further remarks, that "the duties of self-preservation are of primary importance in war, not falling below the art of killing the enemy. Indeed it appears, if we improve so far as to be able simply to keep ourselves in the presence of the foe, while he does not improve in that respect, we must conquer him by mere vitality—by a proper use of meat, drink, clothing, and housing; for while he is perishing by thousands, we shall simply survive him."

It is impossible to calculate the loss a country sustains through sickness in the ranks of its army. Many a battle may be lost, or a victory

but half achieved, may be the consequence; but, independent of this, and putting considerations of humanity also aside, the result is costly to a country like England, where no conscription enforces the enrolment of men, but all are obtained through the medium of the recruiting serjeant and the bait of a bounty.

Directly a soldier dies, or becomes incapacitated for service through sickness, his money value ceases, and his place must be filled up by another. The money is lost to the country, and the effective strength of the army weakened, until the gap is filled up.

A correspondent of "The Times" has remarked upon the false economy of retaining so frail a covering for our troops as the old regulation tent.

"Canvas *versus* Life.—We cover numberless vans and Railway waggons "at home with durable tarpaulin; we cover our soldiers abroad with tents "made of porous canvas, such as Pickford would scorn to use.

"If our valuable goods can be thus protected, why cannot our invaluable "soldiers be equally well screened?

"Nothing is more destructive to the health than wet nightly lodging; "and the false economy which abstains from furnishing the waterproof ma- "terial, contrasts badly with that remarkable instance of true economy, in "a matter where canvas and men's lives were concerned, recorded of Lord "Nelson (by Alison, chap. xxxix. p. 356), who, on bearing down on the "enemy at Trafalgar, made signal when the ships entered into action to "cut away their canvas, in order that no hands might be lost in furling "sails. The loss to the fleet in a few minutes was £200,000, but to this "admirable piece of foresight much of the early success was owing."

The legislature of this country are fast becoming aware of the necessity of providing for the health of the soldier.

Lord Ebrington, in May 1855, drew the attention of the House of Commons to the subject of barrack accommodation, and pointed out the defects of the system in a series of resolutions.

He was warmly supported in his remarks by several Members: Lord Palmerston, Sir Harry Smith, and the Right Honorable Mr. Sydney Herbert, the present Minister of War. Amongst the number, Lord Palmerston observed that, "money spent in improving barrack accommodation was a most economical expenditure, because it not only was a direct saving of money through the health of the men, but it also promoted the efficiency of the service."

The present Minister of War added, "that the question was truly one of expense, but they could not do worse than kill good and well trained men on that account."

Surely the same arguments are equally applicable to tents, because men are more under canvas in time of war, a period when the health and life of the soldier are of the most value; and, since it has become the practice to place our troops under canvas in the country, during the finer portions of the summer months, in order to inure them to the practices of a camp life, it must be also desirable that their health should be preserved whilst learning these necessary duties.

The state of affairs in India justifies the belief that a large European force must necessarily be required for some years to come. These troops must be housed and efficiently protected from the climate, which is such

as occasionally to demand their removal to healthier localities in the mountain districts, where encampments in the open air will be infinitely preferable to the prescribed limits and close confinement of towns. China, too, whose climate is peculiarly inimical to European constitutions, is just now dividing our attention, and many troops will be required for service in that country. The French Government have issued a code of regulations for the guidance of their troops in China: among other things they strongly recommend their avoiding (by any means in their power) sleeping on the ground at night, though it is difficult to imagine how this is to be accomplished with the means at their disposal. I trust however that the tents of our own soldiers may be so improved that the details of disaster and death which so distressed us in the Crimea may not be revived in that remote region.

That all the Government tents are as defective as those in use in the Crimea, and consequently as unfitted for the use of our troops, both in India and at home, will be evident by the following statements from the press:

"The camp at Dover no longer exists. Its occupants, who had hitherto been so quiet, were suddenly in disorder and confusion, from finding their drenched tents blown down by the unexpected gale, which continued to rage for some hours. The soldiers, after fruitless endeavours to keep their tents, were under the necessity of abandoning them, and, finding themselves without shelter, unanimously agreed to leave the camp and enter the town."—ILLUSTRATED TIMES, *October 25th*, 1856.

"During the gale of Thursday week, the whole of the tents of the encampment belonging to the Pembroke garrison at Freshwater East were blown down."—LLOYD'S WEEKLY LONDON PAPER, *October 17th*, 1858.

An officer, writing from the seat of revolt in the East, says—

"I arrived here (Loodianah) last night, after a tiresome march. Those who know India can tell how hot a tent is in May. My tent was blown down on the top of me, and my friend who accompanied me. We were very nearly 'squashed' by it, and had to sit out all night on the ruins, in dust, rain, and wind."—*Vide* TIMES, *September 1st*, 1857.

An officer of the 61st Regiment, who had charge of the party that took the palace at Delhi, and afterwards had the custody of the old King, dating from Ajmere Gate, Delhi, September 28th, 1857, writes as follows:

"The wing to which I belong left Ferozepore on the 25th July, and arrived here on the 14th August. You may fancy how hot it was in tents: the wonder was we did not all die from it."—*Vide* TIMES, *27th November*, 1857.

Admitting the important position the consideration of weight and bulk in baggage must always occupy in connexion with the subject of active movements in the field, I would humbly submit that the first care should be the maintenance of an army in as full force and efficiency as possible.

Every soldier placed *hors de combat*, either by wounds or sickness, not only weakens the effective force, but operates as an impediment upon the movements of an army, to a far greater extent than a small increase in the weight of baggage. He must be attended to, cared for, and moved (if on the march), with all the care possible under the circumstances. Baggage can mostly be destroyed by a retreating army, to prevent its

falling into the hands of the enemy; but the sick cannot be so disposed of, and no greater disgrace or reverse can befall an army than that of deserting their sick to the foe.

Of late years, it has become the practice in most European armies to increase the weight of field ordnance. This entails extra transport for ammunition, and more horses for the movement of the guns. The object in view is to gain an advantage over the opposing forces. How much greater the advantage, if the troops can be kept in health and available for all contingencies?

The trifling addition to the baggage by using the patent tent in its most perfect state would be as nothing compared with the addition to the ordnance; while the patent tent, embracing several important advantages, can be used under its lightest form at a weight not exceeding the one at present in use; and in respect to marquees for hospitals or cavalry stables, the advantage of weight is entirely on the side of the improved system of construction.

Viewing my tents in connexion with the billeting system, Mr. Charles Cowan made a motion in the House of Commons, animadverting upon the demoralizing system of billeting troops in Scotland, and proposing to supersede it by the erection of supplementary surburban barracks throughout the country. Were the armies supplied with the tents of my construction, the billeting system might be far more effectually, and less expensively, superseded than by the plan proposed. The tents could be kept in store under the care of the quarter-master, while the men were in barracks, and when on the line of march they could easily convey their tents by light baggage cars, and pitch them for use in any given locality. The duties of the men, thus constantly alternating between camp and barrack life, they would become thoroughly familiarized with their tents, and pitch and strike them with the greatest ease and expedition.

This system would also be found invaluable in the event of an epidemic breaking out among troops in barracks, as they could easily be removed to any open and healthy locality in the neighbourhood out of the reach of the contagion. It may be argued, that the common tent would also answer that purpose; but it must be borne in mind, that placing men on the ground under an ill-ventilated and crowded tent would be likely, at such a time, to aggravate rather than mitigate the evil.

In the month of February, 1855, I first commenced the construction of my improved tent; from that time to the present I have been unremitting in my endeavours to get them adopted by Her Majesty's Government. In May, 1855, I placed my models before a Committee sitting on tents at Woolwich, and in August of the same year erected a full-sized tent at the Wellington Barracks in St. James's Park.

About this time a great number of invalids had returned from the Crimea, and many of them were located at these barracks. The whole of these men affirmed that my tent would have been instrumental in preventing the losses the army had sustained, and many of them added that if they were sufficiently recovered they would gladly volunteer to return again if they could make certain of having such comforts as my tents provided.

A few weeks ago, being at Chatham, Captain Durnford, of the Royal

Engineers, brought to me a sergeant of that corps in order that I might hear his opinion upon my system of fitting hammocks to tents.

The serjeant observed that the plan would have been invaluable in the Crimea, and would have saved thousands of lives; Captain Durnford added that the serjeant was in the Crimea from the landing at the Old Fort until the final evacuation, and had seen numbers carried to the hospitals merely from sleeping on the ground.

As will be seen by the previous statements, my tents were before Her Majesty's Government long before huts were thought of as a shelter for our troops in the Crimea. That those huts utterly failed in their object is a matter of history; and that they were immoveable when once put together may be gathered from the fact that the army were obliged to leave them behind on leaving the place, and it now appears that the inhabitants of Sebastopol are rebuilding their town with them. The whole of the cost of these huts was lost to the nation, whereas had my tents been used they could have been struck and packed in a few minutes, and ready for use at another time.

I have heard of numerous inventions in relation to military appliances, which seem to have for their chief object the destruction of life in the shortest possible time; but in my remarks this evening, I have endeavoured to show what may be done to preserve the life of a soldier, especially when engaged in active service in an enemy's country.

A MEMBER inquired whether any sewing was required at the seams in addition to the rivets, or was it a mere solution that held the seams together. He also inquired the amount of contraction or expansion per square foot, upon the exposure of the material to the rain, or the sun's heat.

Mr. TURNER: There would be no more expansión than in ordinary linen fabric or duck, as the India rubber was contained between the two fabrics.

In answer to a question from the same Member as to the amount of wet that would be absorbed—

Mr. TURNER said, that it would be very trifling indeed, on account of the rain not penetrating the entire surface. The utmost increase in weight would be about ten or fifteen per cent., whereas the common duck, under the same circumstances, would be increased in weight about seventy per cent. on the whole.

Captain BURGESS inquired what means there were of preventing the canvas from catching fire from the stove.

Mr. TURNER replied, that it in no way came in contact with the stove or funnel. Upon this subject he could not do better than refer to the Report of Quarter Master Menzies, of the Chatham garrison. He said:—

"With a view to testing whether any damage might possibly arise from the ignition of the tent, a large fire was heaped upon the stove, and, as an experiment, a rope was tied round the funnel; this severe trial lasted for some hours, and, upon inspection, it was not found that any injurious effects had resulted, and upon the removal of the rope it was not charred or burnt, although the heat carrried off by the pipe during the time had been intense."

Capt. BURGESS: Is it not the case that stove chimneys of the ordinary construction frequently get very nearly red hot?

Mr. TURNER: Yes, but there is no contact here. It is simply the hot air passing up the funnel. The fireplace does not touch the iron hood, and the smoke passing through the funnel merely gets it to steam heat.

Capt. BURGESS: Is the cap over the chimney made of wood or iron?

Mr. TURNER: Galvanized sheet iron, about three inches deep. The wire ropes are all attached to the flange at the top of the pole or chimney.

A MEMBER: Are the wires attached to the tube before raising?

Mr. TURNER: Yes; the method of raising is very simple. A circle is staked out by means of a line, and pegs are screwed in at stated intervals. The centre being marked by means of a wooden plug, the funnel or pole is passed through the flange, fixed into the centre in its proper place, and the lines depend from it, and are hooked on to the pegs. In striking tents, the lines will unhook at once, and the hooks are slightly curved to prevent any flapping motion detaching them from the pegs.

The CHAIRMAN: Will you favour us with a few remarks as to the comparative cost of your tents?

Mr. TURNER: The Government marquee, the dimensions of which were 29 by 14 feet, and 5 feet 8 inches high at the walls, cost about £34. and contained at the outside about fourteen men, whilst my own of the same size and dimensions, for the same number of men, would cost, if fitted with duck, £33, and, if fitted with waterproof material, about £42. The Government tent of the common size for twelve men costs about £3 10*s*. Mine, for eighteen men, fitted with duck wall and roof, would cost 15 guineas, or with waterproof material £20. The latter tent, however, would last three times as long as the former, besides the extra advantages of stability and comfort. The above cost includes my new screw pegs, but not the stove, which costs from £4 to £5, according to the construction, and with cooking utensils another pound or 25*s*. Each hammock with a pole would cost about 12*s*. 6*d*.

APPENDIX.

Extracts from Official Reports of Commanding and other Officers at Chatham Garrison, relative to Turner's Patent Tent, Marquee, &c., from the Office of the Quartermaster-General, Sir Richard Airey, K.C.B., Horse Guards, London, obtained January, 1860.

From MAJOR-GENERAL H. EYRE, *Commandant, Chatham Garrison.*

Chatham, November 28th, 1859.

SIR,—The tent and marquee of Mr. Turner, referred to in your letter of Sept. 30, having been made trial of by the several battalions (Royal Engineers, 1st Depôt Battalion, 2nd Depôt Battalion, 3rd Depôt Battalion), I have now the honour to submit to you the result (of the trial), as shown in the accompanying reports. You will see that these reports all speak very favourably of them; and I think there is no doubt that a great deal may be said in their praise.

For a camp likely to be of any duration, in fact, on such a service as our *army encountered in the Crimea*, this tent and marquee would be very valuable, but the important

question to have decided is, whether they can be made available with advantage on daily active service? . . . . . I am inclined to think they would bear the test, and would be found to answer better than any yet invented. . . . . .

I have the honour to be, Sir,
Your obedient humble servant,
H. EYRE, Major-General.

To Sir RICHARD AIREY, K.C.B.,
Quartermaster-General Horse Guards.

Extracts from Reports to which Major-General H. Eyre alludes in his letter.

From QUARTERMASTER WILLIAM MACKAY, *Second Depôt Battalion, Chatham.*

Chatham Garrison, 22nd Sept. 1859.

(MEMORANDUM).

Mr. Turner's field tent, pitched by six men in nine minutes, including the fixing of the fire-place and ventilator. Struck and put into the valise, by the same number of men, in four minutes.

Advantages over the Government Field Tent.

1st. Ventilation can be regulated according to the temperature.

2nd. There being no strain on the canvas (it being merely a covering laid over a frame of galvanized wire ropes), which cannot shrink by moisture, a considerable saving will be afforded in wear and tear of canvas, lines, and tent-poles.

3rd. The pegs being screwed into the ground, no reasonable amount of pressure to which they can be exposed can draw them.

4th. It can be used either with or without a fire-place; and, as all the gear which comes in contact with the flue is iron and brass, no danger need be apprehended from ignition.

5th. The greatest of all advantages is, that the men can sleep off the ground; at first it was tried with twelve hammocks, occupied by twelve men, where they slept very comfortable; it was then completed to eighteen, the number which it is designed to accommodate; and around a wooden pole . . . . . .

6th. As the ground-screws cannot be drawn; and, should they be so, the weight of the men gravitating towards the centre, prevents it being blown down by the storm, which the present Government tent is very subject to.

On the 29th September, 1859, the tent was struck by six men in four minutes, and pitched in nine minutes. . . . . .

(Signed) WILLIAM MACKAY.

To Major of Brigade,
&c. &c. &c.
Brigade Office.

Proceedings of a Board ordered to assemble by order of Colonel R. N. Phillips, commanding the 2nd Depôt Battalion, to report upon a Marquee and Bell Tent, the Inventions of Mr. George Turner.

Chatham, Oct. 1st, 1859.

MAJOR F. G. T. DESHON, 2nd Depôt Battalion. *President.*
CAPTAIN WILLIAM M. LEES, 23rd Regiment.
LIEUTENANT T. D. WOOD, 29th ditto
QUARTERMASTER WILLIAM MACKAY, 2nd Depôt Battalion. } *Members.*

The Board having examined the tents, viz., a marquee and bell-tent, which have been pitched for trial in the Spur Battery, report as follows:—"The bell-tent has been pitched and struck three times by six men; each time it was pitched in nine minutes; the fixing of the fire-place and ventilator being included in the operation. It was struck and packed in the valise in four minutes. The same number of men pitched and

struck the common bell-tent in the same time; but it must be observed, that Mr. Turner's tent would have been pitched in a much shorter time, had it not been for the fixing of the fire-place and ventilator—contrivances which the men had not seen before, and which in themselves require more time in being put together than the mere raising of the pole of the common bell-tent.

The advantage of Mr. Turner's tent over the common bell-tent consists in the contrivances for the slinging of hammocks, by which the men are enabled to sleep off the ground, and in its being well ventilated by the opening in the top round the pole.

The capability of the tent being warmed by a stove, is another advantage; but, even without the fire-place, this tent is stated by the men to be more warm and comfortable than the old tent, for the fact of their not sleeping on the ground, the coldness, hardness, and dampness of which they complain. The Board have, therefore, to report most favourably on Mr. Turner's bell-tent, the construction of which contains many advantages; and they consider that it presents nothing impracticable for service in the field.

With regard to the marquee, the Board consider it possesses many advantages over the one at present in use, as to weight, and space, and means of warming it . . . . . .

(Signed)

F. G. T. DESHON, Major, 2nd Depôt Battalion. *President.*
W. LEES, Lieutenant, 23rd Regiment.
T. D. WOOD, Lieutenant, 29th ditto.
WM. MACKAY, Quartermaster, 2nd Depôt Battalion. } *Members.*

To Col. R. N. Phillips,
Commanding 2nd Depôt Battalion,
Chatham.

From COLONEL R. N. PHILLIPS, *Commanding 2nd Depôt Battalion, Chatham Garrison.*

Chatham, 3rd October, 1859.

SIR,—I have the honour to forward the proceedings of a Board of Officers assembled to report upon Mr. Turner's marquee and tent, occupied by the 23rd Regiment; and, having examined these tents, I coincide with the opinions expressed by the Board . . . .

I have the honour to be, sir,
Your obedient servant,
R. N. PHILLIPS.

The Major of Brigade,
&c. &c. &c.
Brigade Office.

Extracts from the Proceedings of a Committee assembled at Brompton Barracks, Chatham, by order of Lieut.-Colonel Ross, Commanding, to report upon Mr. Turner's Tent and Marquee.

CAPTAIN DURNFORD, R.E. *President.*
LIEUTENANT CLAYTON, R.E. } *Members.*
LIEUTENANT WYNNE, R.E. }

Turner's Bell Tent.

On examining this tent, for a description of which *vide* Mr. Turner's pamphlet, pages 6 to 16, the Committee observe:—

1st. That a very great advantage is gained by raising the men off the ground by means of hammocks for sleeping purposes, which may also be used for the transport of wounded men, being borne by two or four men, according to the distance to be traversed. . . .

2nd. The tent lines attached to a collar fitting on the tent pole, entirely under the covering of the canvas, seems a good point in this tent, quite obviating the serious defect of the line tearing through the canvas as in the common tent, to the canvas of which the hempen lines are attached. Turner's lines being of galvanized iron wire, do not expand and contract when dry or wet, thereby doing away with the inconvenience of slacking off

tent lines in wet weather. It is alao considered that wire rope, from its strength and durability, is well adapted for tent lines and guys. Mr. Turner serves with list those portions of the lines in contact with the covering of the tent, which appears a good precaution, preventing the contact of the wire and canvas. Attached to the tent lines are small lashings used by day for the purpose of tricing up the hammocks, and by night for securing the rifles, so that each man has his weapon at hand in case of alarm. The belts can be attached to the end of the hammock poles, nearest the wall of the tent.

Some experiments were made by the Committee to ascertain the respective holding powers of the common wooden pickets, as used in the service, and Turner's iron pegs, with the following results:—

1st. In loamy soil, the common small wooden picket drew with a weight of about 280 to 290 lbs., Turner's small screw peg with a weight of about 830 lbs. A large wooden picket for guys broke in driving, and a second of sound oak broke with a weight of about 580 lbs. Turner's medium screw was unaffected by a weight of about 920 lbs., which was the most the apparatus used would safely bear, and, consequently, the large screw was not tried.

2nd. In made ground, consisting of lumps of chalk, rough stones, and pieces of brick, the small wooden picket drew with 300 lbs. The large wooden picket of ash broke with about 800 lbs. Turner's barbed rock picket drew with about 600 lbs., and his small screw peg, which was screwed down with some difficulty, with about 800 lbs. In each case, Turner's pegs were driven in perpendicularly to the ground, and the wooden pickets slanting, as in using them for the lines of a tent. The strain was applied in each case as if by a tent line or guy.

From these experiments, it would appear that Turner's pegs answer admirably.

The Committee would express their cordial approval of Mr. Turner's system of providing hammocks for sleeping purposes. . . . . And also of his staying the tent pole with lines, and throwing a covering over all, thus ensuring perfect stability so long as the tent pegs hold; and Mr. Turner's appears to answer the purpose very effectually. They also approve of the good system of ventilation, so defective in the service tent; also of the reduced height of the tent (9 feet), and increased depth of wall (2ft. 6in.) . . .

Turner's Hospital Marquee.

Mr. Turner's Hospital Marquee, of the same size as the service one, is erected upon the same principle as the Bell Tent, having the poles or tubes stayed by wire lines, and a covering of mineralized waterproof fabric thrown over all.—Mr. Turner's Pamphlet, pages 16 to 22. . . . . The Committee would, however, remark that Mr. Turner's marquee appears to fulfil several requisite conditions for hospital purposes, being dry, warm, well ventilated, and of perfect stability. . . . . In conclusion, the Committee must observe that the advantages . . . of Mr. Turner's tents must be considered in a *hygienic point of view*, and it becomes a question for deep consideration whether the *undoubted advantages* to be derived from a tent which secures the army, in a great degree, from the bad effects of exposure to wet and cold, heat and impure air, will not, in most cases, more than counterbalance the . . . increased weight to be transported, by preserving the men in a state of health and efficiency.

(Signed)
A. Durnford, Captain Royal Engineers, *President.*
V. G. Clayton, Lieutenant ditto } *Members.*
E. T. Wynne, ditto ditto }

Brompton Barracks, Chatham, 15*th November*, 1859.

. . . . . .

I concur in this report.
(Signed) H. Sandham,
Colonel Commanding, Royal Engineers, Chatham Garrison.

The Quartermaster-General,
Horse Guards.

Evening Meeting.

Monday, February 20th, 1860.

Captain E. G. FISHBOURNE, R.N., C.B., in the Chair.

The Chairman announced that fourteen Members had joined the Institution since the 31st of January.

LIFE MEMBERS.

Heaton, Jno. R. Major 37th Regt.

ANNUAL SUBSCRIBERS.

Reid, Geo., Capt. Beng. Cav.
Portman, Hon. W. H. B., Col. West Som. Yeo. Cav., M.P.
Leahy, Edmund, Lieut. North Cork Rifles.
Prendergast, C. L., Ens. H. M. Indian Army.
Arbuckle, G. B. V., Capt. late 57th Regt.
Slade, Alex. F. A., Capt. 57th Regt.
Goff, R., Lieut. 50th Regt.
Smyth, Jno. M., Capt. 10th Regt.
Bowden, H. G., Capt. S. F. Gds.
Mountain, R. F., Capt. Roy. Art.
Havelock, Sir Henry, Bart., Lt.-Col. 18th Royal Irish.
Higgins, W. F., Esq., late War Dept.
Blockley, John, Lieut. H. A. Coy.

PRESENTS.

LIBRARY.

Books.

Royal Artillery Institution.—Occasional Papers. Vol. I. No. 19.
Presented by the Institution.

Leeds Philosophical and Literary Society.—Annual Report of the Society, 1858-59.
By the Society.

The Invasion of England rendered impossible. Pam. London, 1860.
Presented anonymously.

Orders in Council as to Naval Rank Pay, Promotion, Retirement. 1 vol. 8vo.
Presented by the Lords Commissioners of the Admiralty.

Two Years in Ava, from May 1824 to May 1826. By an Officer of the Staff of the Quartermaster-General's Department. 1 vol. 8vo. 1827.

Penal Code prepared by the India Law Commissioners. 1 vol. 8vo. London, 1838.

Memoirs of Zehir-Ed-Din-Muhammed-Baber, Emperor of Hindustan.—Written by himself and translated by the late John Leyden, Esq. M.D. 1 vol. 4to. London, 1826.

De Stuers, F.V.A. Major. Mémoires sur la Guerre de l'isle de Java de 1825 à 1830. 1 vol. Small 4to. Leyde, 1833.

Guicciardini, Francesco. Della Istoria d'Italia. 2 vols. Folio. Venice, 1738.
Presented by John Crawford, Esq. F.R.S. &c.

MUSEUM.

Military.

2 Burmese Spears, taken at the capture of Bassein.
Presented by Dr. McCosh, H. M. Bengal Army.

Naval.

Model of the Raft "Nancy," constructed and used at the capture of Taganrog. By Captain Cowper P. Coles, R.N.

2 Models of Rafts for shipping Horses.

Model of Mortar Raft. *Presented by Captain Cowper P. Coles, R.N.*

Model of the first Life Boat. *Presented by the Hon. J. T. Carnegie.*

Miscellaneous.

Clock Watch, time of James II. *Lt.-Col. J. Percy Neville.*

One of the Iron Plates for holding together grape shot, found in the open space in front of the Redan, Sevastopol.

Presented by T. Longmore, Esq. Dep-Inspector-General of Hospitals.

3 Medals in Bronze: viz., of Miss Nightingale, Victor Emanuel, and Lord Raglan, in case.

3 Ditto ditto, commemorative of the battles of the Alma, Inkerman, and Balaklava, in case.

1 Ditto ditto, commemorative of the fall of Sevastopol, in case.

Presented by Mr. T. R. Pinches.

Cast of the Statue of "Mars in Repose," the original in the Ludovisi Villa Museum at Rome. *Presented by E. Jekyll, Esq. late Gr. Guards.*

ON IMPROVEMENTS IN DIVING DRESSES AND OTHER APPARATUS FOR WORKING UNDER WATER.

By JOHN WILLIAM HEINKE, Assoc. Inst. C.E.

ALTHOUGH the invention of the diving bell has been generally assigned to the sixteenth century, yet there are evidences of others, although rude modes, having been adopted long anterior to that era. Beckmann, in 1770, quoted a passage from Aristotle (problem xxxii.) to show that the divers of his time used a sort of kettle to enable them to remain longer under water; but the inference drawn does not seem very clear. The renowned friar Roger Bacon, who flourished about 1250, has been considered by some to be the originator of the diving bell, or of some machine to facilitate working under water; but little credit can be attached to the tradition. The earliest mention of anything of the kind that can be depended upon is by John Taisner, who says he saw the experiment made by two Greeks at Toledo, in Spain, in 1538, before the Emperor Charles V., and ten thousand spectators. Gaspar Schott (Nürnberg, 1664) repeats the story, and calls the vessel an "aquatic kettle;" but prefers another apparatus which he designates "aquatic armour," that enabled those covered with it to walk under water. The plate accompanying the description represents a man walking in the water, with something like a small diving bell over his head.

In an edition of Vegetius, on "The Art of War," published in 1511, there is an engraving which represents a diver with a cap on his head, from which rises a long leather pipe, with an open end floating on the surface of the water.

Lorini, in his work on Fortification, published at Venice in 1609, gives a plate and a description of a diving apparatus, or chest, which he describes as "a square box bound with iron, furnished with windows, and has a stool affixed to it for the diver;" but he does not lay claim to the discovery, and seems to consider it as a machine already known.

Francis Kessler, of Oppenheim, in 1617, gave a description of a suit of water armour, which, however, Beckmann and others declared could not be used with safety.

About 1620, Cornelius Debrell contrived a submarine vessel, or boat, to be rowed and used under water. This was tried upon the Thames, by order of James I., and is said to have succeeded admirably; it carried 12 rowers, besides passengers. This vessel is mentioned by Robert Boyle, in his "New Experiments Physico-Mechanical," wherein he professes to give Debrell's secret from authority; he says, "the composition was a liquid that would speedily restore to the troubled air such a proportion of vital parts as would make it again, for a good while, fit for respiration." This novelty induced his Most Serene Highness Charles Landgrave of Hesse Cassel to have a diving vessel constructed for the same purpose; some years afterwards it was described (with a diagram) in the "Gentleman's Magazine."

The celebrated Lord Bacon, in his "Novum Organum," 1645, suggested a machine where the diver "stood upon a stool of 3 feet as a tripod, which was in length somewhat less than a man, so that the diver, when no longer able to contain his breath, could put his head into the vessel, and having breathed again, returned to his work."

Bishop Wilkins, in his "Mathematical Magic," 1648, proposes a a machine "whose benefits shall be incalculable: 1st. Privacy, as a man may go to any part of the world invisible, without being discovered or prevented. 2nd. Safety, from the uncertainty of tides and tempests that vex the surface, from pirates, robbers, and ice, which so much endanger other voyages towards the poles. 3rd. It may be used to undermine and blow up a navy of enemies, or to relieve a blockaded place." His plans were, however, wholly theoretical.

In 1663, the Marquis of Worcester published the heads of his "Century of Inventions," the necessary directions for carrying out these projects having been lost, as it is stated in his observations on the title page. Proposal 9 is—"A ship destroying engine, portable in one's pocket, which may be carried and fastened on the inside of the greatest ship, and at any appointed minute, though a week after, either of day or night, it shall irrecoverably sink that ship." Proposal 10—"Away from a mile off, to dive and fasten a like engine to any ship, so as it may punctually work the same effect, either for time or execution." Proposal 11—"How to prevent both. How to prevent and safeguard any ship from such an attempt by day or night."

In 1669 Borelli contrived a "vesica," or bladder, which was, in fact, a copper vessel two feet in diameter, with glass fixed before the face of the wearer. This contained the diver's head, and was fixed to a goat-skin habit, exactly fitted to the shape of the body. He carried an air-pump by his side, by means of which he condensed or rarified the air in the vessel, and thus made himself heavier or lighter on the same prin-

ciple as fishes. Within this "vesica" there were pipes, by means of which a circulation of air was contrived; thus equipped, and with artificial webbing to the feet, to enable him to tread the water, the inventor supposed that he had overcome all difficulties hitherto known or objections to which such machines were liable. Hooke, in 1681, in his "Philosophical Collections," speaks of Borelli's apparatus, of which he gives a plate, as also of one which he claims to have himself constructed. This he describes as "another way of swimming under water, and breathing by the help of a leather pipe, kept open by wreathed wires, and extending from the diver's head to the top of the water." In 1678, a German named Sturm was enabled to make some further improvements in Borelli's apparatus, but neither seem to have answered the intention, or ever to have been used.

Mersennius, in his publication at Amsterdam in 1671, proposed a submarine boat, by which persons might pass from place to place under water, move it to and fro, and make it rise or sink in a river or sea; this project failed, however, like all its predecessors. Another proposal for a diving machine appears also in the same place and in the same year, from Nicolas Witsen; he describes his invention very explicitly, and gives instructions to the divers, as to its proper use and management, but there is not any account of its real utility or success.

The Duke of Argyle, among others, joined in the mania, and determined upon examining the wreck of a vessel sunk off the Isle of Mull in 1588, being, in fact, one of the Spanish Armada, and supposed to be richly laden. He engaged for the task a man named Colquhoun, of Glasgow, who went down several times, but merely surveyed the wreck as well as he could. The apparatus he employed seems to have been made after that suggested by Hooke, and consisted of a long pipe of leather by which the air was communicated, his head being covered with some sort of bell. In 1688 Sinclair, a professor in the university of Glasgow, published his principles of navigation, in which, in a postscript, he gives directions how to buoy up any ship of burden from the ground to the surface of the sea, and he speaks of the apparatus employed in searching the vessel as being similar to that which Colquhoun had previously used.

The most successful adventure of the period was undertaken by one Phipps, a ship's carpenter, the son of a blacksmith at Boston in America. He began to operate in 1687, with an apparatus, the character of which is now unknown, upon the wreck of a Spanish galleon lying off the coast of Hispaniola; but what he then recovered did not repay the outlay. Nothing daunted, he determined upon trying again, and assisted with money (though most usuriously) by the Duke of Albemarle, son of the well known General Monk, he eventually, but with much difficulty, rescued property of the value of nearly £300,000, of which sum he received about £20,000 for his own share. In other ventures he was equally successful. He was afterwards knighted, became sheriff of New England, and founded the present noble family represented by the Marquis of Normanby.

With the publication of a work by Pasch at Leipsig in 1700 the century closes. His plan was merely an alteration of others that had preceded, and was never probably tried with success.

The celebrated Dr. Edmund Halley, Secretary of the Royal Society, paid great attention to the subject for some years, and from his continued experiments, and the very different structure of his machine, he was considered as the inventor of the diving bell; that notion has, however, long been exploded.

In 1716 he read his paper entitled "The Art of Living under Water" before the Royal Society, and the following extract conveys his views. He says—

When there has been occasion to continue long at the bottom, some have contrived double flexible pipes to circulate air down into a cavity, enclosing the diver with armour, to bear off this pressure of the water, and give leave to his breast to dilate upon inspiration, the fresh air being forced down by one of the pipes with bellows or otherwise, and returning by the other of them not unlike an artery or vein. This has been found sufficient for small depths not exceeding twelve or fifteen feet, but when the depth surpasses three fathoms, experience teaches us that this method becomes impracticable; for, though the pipes and the rest of the apparatus may be contrived to perform their office duly, yet the water, its weight being now become considerable, does so closely embrace and clasp the limbs that are bare or covered with flexible covering, that it obstructs the circulation of the blood, and presses with so much force on all the junctures where the armour is made tight with leather skins or such like, that if there be the least defect in any of them the whole engine will instantly fill with water, endangering the life of the man below.

To remedy these inconveniences the diving-bell was next thought of.

He then describes his contrivance, which was a truncate cone of wood, containing 60 cubic feet in its concavity, the diameter at the top being 3 feet, and at the bottom 5 feet. In the top was placed a strong clear glass to give light, and a cock to let out the air that had been breathed. The machine was coated with lead and otherwise weighted, that it might sink steadily; when below it was supplied with air by two barrels of 36 gallons each, which were alternately lowered and raised, full and empty. In this instrument he says that he remained without inconvenience, wholly dressed, with all his clothes on, for one hour and a half at a depth of 10 fathoms.

He subsequently conceived a method by which the diver could leave and walk about some distance. This he also described to the Royal Society in 1721. He says—

I bethought myself how to enable the diver to go out of the bell to a considerable distance, and to stay a sufficient time without it, with full freedom to act as occasion served. . . . . I procured pipes to be made which answered all that was hoped from them. They were secured against the pressure of the water by a spiral brass wire, which kept them open from end to end.

This appears to have been an adaptation of Hooke's apparatus, or of that used by Colquhoun. These tubes, of which the diameter of the cavity was about one-sixth of an inch,

were coated with thin glove-leather curiously sewed on, and then we dipped the leather into a mixture of oil and beeswax hot. Then we drew several folds of sheep's guts over them, which, when dry, we painted with a good coat of paint, and then secured the whole with another coat of leather, to keep them from fretting. The pipes, of which we made several, were about 40 feet long, the size of half an inch rope, the one end thereof being fixed in the bell, and the other fastened to a cock, which opened in the cap. . . . . The diver, therefore, putting on his cap, and coiling his pipe on his arm, like a rope, as soon as he is discharged from the bell opens a cock and marches on the bottom

of the sea, seeing that the coils of his pipe are clear which serves as a guide to direct him back again, &c. The leaden caps were made to weigh half a hundred weight, to which I added a girdle of large weights of lead, of about the same weight in the whole, to be worn about the waist, and two clogs of lead for the feet of about 12lbs. each.

About the same time that Dr. Halley read his first paper to the Royal Society, in 1716, a person named John Lethbridge, of Newton Abbot, near Exeter, invented a machine which was made under his directions by a cooper in Stanhope Street, Clare Market, the particulars of which he published about thirty-three years afterwards in the Gentleman's Magazine. He thus describes it:—

It is made of wainscot, perfectly round, about 6 feet in length, about 2¼ feet in diameter at the head, and about 18 inches diameter at the foot, and contains about 30 gallons. It is hooped with iron hoops without and within, to guard against pressure; there are two holes for the arms, and a glass about 4 inches diameter, and 1¼ thick to look through, which is fixed in the bottom part, so as to be in a direct line with the eye; there are two air-holes upon the upper part, into one of which air is conveyed by a pair of bellows, both of which are stopped with plugs immediately before going down to the bottom. At the foot there is a hole to let out water; sometimes there is a large rope fixed to the back, or upper part, by which it is let down, and there is a line called the signal line by which the people above are directed what to do, and there is fixed a piece of timber as a guard for the glass. I go in with my feet foremost, and when my arms are got through the holes, then my head is put on, which is fastened with screws. It requires 5 cwt. to sink it, and taking 15 lbs. from it, it will buoy upon the surface of the water. I lie straight upon my breast all the time I am in the engine, which hath many times been more than 6 hours, being frequently refreshed upon the surface by a pair of bellows. I can move it about 12 feet square at the bottom, where I have stayed many times 34 minutes. I have been 10 fathoms deep many hundred times, and have been 12 fathoms, but with great difficulty.

Another claimant appeared nearly at the same time in the person of Nathaniel Symons, of Harburton, near Totnes. He produced a diving machine in the shape of a boat, in which, before many hundred persons, he sank himself in the river Dart, where he remained three-quarters of an hour, and then reappeared. He complains with evident disappointment that, "though a great number of gentlemen of worth were present, he received but one crown piece from them all."

In 1724 Jacob Leupold, of Leipzig, describes an apparatus then in vogue, but of which he does not claim the invention. Later still, Martin Triewald, military architect to Frederick, King of Sweden, greatly improved upon Halley's invention, by making a machine both lighter and less expensive. In the head of his apparatus, which was of tinned copper, and which was managed by two men, he used, in lieu of plain glass, convex lenses to admit the light. He published the particulars at Stockholm, in 1732, and the description was subsequently read before the Royal Society.

About 1750 a Mr. Rowe invented a diving machine for searching wrecks, which consisted of a hollow copper vessel of sufficient dimensions to contain the body of a man, with holes at the sides through which his arms protruded. At the end of the "engine" glasses were placed, through which he could see the objects of his search. The diver was lowered by a rope, and could remain below for half-an-hour without any difficulty.

A daring but unfortunate attempt to use a submarine vessel was made in 1774, by Mr. Day, in Plymouth Sound. So confident was he of success, that he had a small ordinary vessel prepared for the purpose according to his directions, and at the time appointed for making the experiment, all being ready, he sank the vessel and himself, in the presence of a great many spectators, but he never rose again.

In 1775 Mr. Spalding brought out an improvement upon both Dr. Halley and Triewald's apparatus, and was rewarded by the Society of Arts with twenty guineas; he was followed by Fairey, who rendered it still more complete and more applicable to the required purpose.

About the same time (1775) a Mr. Bushnell, of Connecticut, endeavoured to realise the project of Bishop Wilkins, and with the apparatus he constructed he offered the newly formed Republican Government of America to destroy the British shipping then lying in their different harbours and rivers; but, although he found it quite practicable to travel under water, he did not succeed in the rest of his design. His machine had a resemblance to two upper tortoise shells of equal size joined together, and it was capable of holding the operator with sufficient air to support him for thirty minutes. He could swim so close to the surface of the water as to approach unperceived very near any ship during the night. He could sink quickly at any depth he pleased, could rise to the surface for fresh air, and descend again at pleasure, as described in his publication of 1787.

This scheme was resuscitated in 1822 by Mr. Samuel Colt, who proposed to the Government of the United States to construct a machine which would effectually realise all that Bushnell had suggested. In order to test its utility, the Secretary of the Navy was instructed to render Mr. Colt every assistance and facility, and to appropriate 15,000 dollars for the purpose. A vessel was actually destroyed at some distance from the shore, but the means employed were not made public.

Benjamin Martin, originally a plough-boy in Surrey, but afterwards a celebrated optician and globe manufacturer in Fleet Street, published in 1778 a description of his diving apparatus. It consisted of strong leather, so prepared that no air could pass through it, fitted to his arms and legs, and had a glass window in the front part. This apparatus held half a hogshead of air, and when dressed in it he could walk on the ground at the bottom of the sea, or enter the cabin of a submerged ship and take out any valuables. He appears to have used this apparatus rather successfully. In his work he speaks of a machine for the same purpose by a gentleman in Devonshire: it is presumed that he alludes to Lethbridge's apparatus previously described.

Smeaton, in 1779, first employed the diving bell for civil engineering operations; it was used in repairing the bridge at Hexham, in Northumberland. The apparatus was an oblong wooden box, 4 feet high, 2 feet wide, and 3 feet 6 inches long. It was supplied with air by a pump fixed on the top. He afterwards constructed an improved apparatus, of which he made use in the construction of Ramsgate Harbour, in 1778. Mr. Rennie subsequently made great improvements in it, adapted it to local circumstances, and extensively used it at the works Howth Harbour, near Dublin.

The apparatus designed by Mr. Kleingert, of Breslau, was first described in a pamphlet published in 1798. The harness, or armour, was made of strong tin plate, in the form of a cylinder, which inclosed the diver's head and body; it consisted of two parts, that he might easily get it on. Besides this, he had a jacket with short sleeves, and a pair of drawers of strong leather, water-tight, and joined by brass hoops round the metal on the outside, so that he was relieved from pressure on all parts except the legs and arms. With this apparatus, on the 24th of June, 1798, a man named Joachim under his direction, and before many spectators, dived and sawed through the trunk of a large tree at the bottom of the river Oder, near Breslau.

At this time there were many projects of analagous character, but none particularly worth notice, except that by Robert Fulton, who first introduced steam navigation on the rivers of America. At the close of the last century he made a submarine boat or chest, which he exhibited under the patronage and at the expense of the French Government on the Seine, at Havre and Rouen, and afterwards at New York and other places in America.

In the year 1786, Messrs. John and William Braithwaite were engaged in recovering the guns from the floating batteries which were sunk off Gibraltar; and they presented eight pieces of fine Spanish ordnance to the Emperor of Morocco. In the year 1789 and 1790, they successfully searched for and recovered all the dollars and a large quantity of tin and lead from on board the Hartwell East Indiaman, lost off Bonavista, Cape de Verd Islands. This was accomplished, in depths varying from 5 to 7 fathoms, by means of Mr. John Braithwaite's diving machine. On their return from Bonavista, they negociated with the Government to commence operations on the Royal George, and they made all the necessary preparations. But, although the ship ostensibly belonged to the Admiralty, its guns were claimed by the Ordnance; hence difficulties arose between the Government departments, which induced Messrs. Braithwaite to relinquish their designs. From the wreck of the ship Earl of Abergavenny, outward-bound East Indiaman, of 1,300 tons burthen, they succeeded in recovering nearly all the cargo, and £75,000 in dollars. This vessel was lost in 1805, and after having laid under 10 fathoms water for 16 months, during which time many unsuccessful experiments were made by Mr. Tucker, Mr. John Braithwaite, by means of his peculiar diving machine (but which was not a diving bell), succeeded in raising the ship and cargo, amounting in value to many thousands of pounds. By this apparatus he was enabled to remain under water eight or ten hours at a time, and to conduct the various operations which were effected by machinery exclusively his own, and by the aid of gunpowder. The diving machine which he employed is now the property of his son, Mr. John Braithwaite (M. Inst. C.E.), who, with his brother, was present on several occasions to witness the operations.

The Plymouth Breakwater, for which many plans had been suggested, was commenced on the 12th of August, 1812, the first stones being deposited with much ceremony. In the progress of a work of such magnitude, extending over many years, and which, in fact, is scarcely yet completed, this mode of working below has been found of essential

service, and has been adopted wherever it has been necessary to have firm and substantial masonry constructed under water. At the works for the harbours of refuge at Dover and at Alderney it is extensively used by Mr. Walker.

But perhaps one of the most striking uses to which it has ever been applied was in the demolition of the wreck of the ill-fated Royal George, sunk off Spithead, in August, 1782. In less than a month after the accident several proposals were made for weighing her, and the proposition of Mr. Tracey was selected from those of 118 candidates. It was no easy undertaking, considering that the weight of the guns, stores, &c., on board, amounted to 1,031 tons, and that she had sunk 13 feet into a bed of silt, or blue clay. After a trial of three seasons, and an expense of £12,000, borne between the Government and Mr. Tracey, the project was abandoned. Thus matters rested until June, 1817, when Mr. Ancell, of the Portsmouth Dockyard, went down in a diving bell and surveyed the wreck, as far as was practicable, in a depth of water of 10 fathoms. Another respite of 17 years then took place. In the meantime, Mr. Deane, with an apparatus which was originally intended for the recovery of property from houses or factories while on fire, but which, having failed to obtain the patronage of the insurance offices, he applied to diving purposes, succeeded, in 1828, in clearing the wreck of the Carnbrae Castle, Indiaman, lost at the back of the Isle of Wight. He also operated upon the wreck of Her Majesty's ship Boyne, burnt, at the latter part of last century, off South Sea Castle. He then offered to remove the wreck of the Royal George, and after some delay received permission to make the attempt. In 1834-5-6, having had more perfect apparatus made under his directions by Siebe, he was enabled to bring up 28 guns (of which 21 were of brass, and in good preservation), and also some other portions of the wreck.

His task being so far complete, he attempted, with success, to bring up the guns of the Mary Rose, which was lying not far from the other wreck. This vessel had been submerged for nearly 300 years, as she went down in July 1545, and its situation was only discovered in 1836 by some fishermen, whose nets had sustained injury from something protruding from the bottom of the sea. In 1836 he succeeded in raising twenty-five guns, five of which were of brass, and the other twenty of wrought iron. The brass guns bore date 1535, and the maker's names were Robert and John Owyn. The other guns were of peculiar construction, being manufactured of wrought iron bars, secured by thirty-three hoops ;* besides these, he brought up some iron and many granite shot, eight ancient bows,* a number of miscellaneous articles, and part of the oak mainmast ; the latter still in good preservation.

In 1839 the operations upon the Royal George were resumed under the direction of Colonel (now Lieutenant-General Sir C. W.) Pasley. It was determined, if possible, to clear the roadstead, although, at one time, doubts were entertained of the propriety of attempting it, unless it could be done so effectually as to entirely free the bank from all debris. The destruction of the remains by gunpowder having been resolved upon, cylinders were prepared, and being heavily charged, the first explosion

* One of these guns, and a long bow, are in the Museum of the Institution.—Ed.

was reserved for and took place on the 29th of August, 1839, that being the fifty-seventh anniversary of the melancholy event. On the 20th of September, a charge of 260lbs. of powder was fired by the voltaic battery ; and this is supposed to have been the first public practical adaptation of such means, although the applicability of the voltaic battery for such purposes had been previously demonstrated by Mr. J. Bethell (Assoc. Inst. C.E.) on the 24th of April, 1838, at the Institution of Civil Engineers. The effect was instantaneous, highly satisfactory, and grand beyond description. The surface of the water was immediately covered with dead fish and with fragments of all descriptions, curiously covered with seaweeds, and of richly tinted colours. During the season were recovered, among other things, five brass guns weighing 26,072lbs. (the value of which, as old metal, was estimated at £1,000), and seven iron guns.

In 1840 the Colonel again resumed operations, and with the same success ; having an able assistant, as a diver, in Mr. George Hall, of Whitstable, with about eighty men, including Sappers and Miners. The apparatus employed was manufactured by Siebe, by whom several alterations, at Deane's suggestion, had been made in that previously used.

By the end of 1841 much valuable timber was rescued ; indeed, beteen the months of May and November in that year, not less than 18,600 feet, or 372 loads of timber were brought up, and, being afterwards sold by public auction, great quantities were preserved as relics.

The season of 1842 was quite as satisfactory as those preceding, and in that of 1843, the harbour was finally cleared of all obstruction. The consumption of gunpowder during the operations was 52,963 pounds, and there were recovered no less than 581 cwt. 2 qrs. 14lbs. of various sorts of metal (exclusive of 86 guns), and 59,000 cubic feet of timber.

It may be remarked, as somewhat curious, that of all the money which must have been on board at the time of the catastrophe, when 1,200 persons went down, only two guineas were found. It is, moreover, satisfactory to know, that during the works no accident occurred, attended with loss of life or limb, although there were three or four narrow escapes. But perhaps the most singular incident is, that an actual fight took place below between two divers for the possession of some portion of the wreck claimed by both ; in the scuffle the glasses of one helmet were broken, and the diver was nearly drowned before he could be rescued. Such an accident is now, in my apparatus, effectually provided against by helmet slides.

The operations against the wreck in question also resulted in great benefit to the practice of diving, the applicability of the apparatus having been tested in every possible manner. Many of the Sappers and Miners, both of the regular Army and of the East India Company, were fully initiated in the use of diving apparatus, and sailors from different vessels were also trained so as to be useful in cases of emergency.

In France there had been many efforts towards establishing the practicability of submarine boats, but the great difficulty was how to supply air to the men employed. Dr. Payerne however felt convinced, that it was practicable, by chemical means, to restore the purity of the air under water, without communication with the atmosphere. This experiment

was first tried in England at the Polytechnic Institution, and was then repeated with success at Spithead.

On the latter occasion the bell was accompanied by four cylinders, each four feet long and twelve inches in diameter, containing condensed air, which was forced into them by an air pump, and allowed, when required, to flow into the bell by turning a cock. Another experiment was made without cylinders ; the end of one of the diver's air pipes was conducted into the bell, and air was forced through it by one of the small pumps ordinarily used for supplying air to a helmet diver. The water was kept out of the bell as well as under the ordinary system, and the respired air was renewed in a perfectly satisfactory manner. The result was approved by Lieutenant-General Sir C. W. Pasley and other scientific men, the air for respiration being perfectly good, and the whole apparatus for purifying it so compact and simple that it could be contained in a case not larger than a common portable desk, and it could be used without any trouble.

The helmet diving apparatus has now become of comparatively common use, for the repair of lock gates and other works under water. In the building of almost all docks, bridges, &c. of any extent, it is in constant use ; and in examining accidents occurring to vessels, and more especially to the shafts of screw propellers, to rudders, &c., it has been very useful. It has been so constantly exhibited at the Polytechnic Institution and at the Panopticon, that it has become familiar to all.

Besides the various alterations and improvements already mentioned, there have been many others that deserve notice.

In 1835 Mr. J. Bethell introduced several important improvements in the form and use of diving apparatus.

In 1836 Mr. William Bush, of Bishopsgate, claimed the introduction of air pumps into diving bells, instead of pumping air down from above ; the application of a pump to diving dresses, whereby the diver might supply himself with air from above, and the use of an air belt, combined with a diving dress, to facilitate the diver in rising and sinking. He also applied a compass to the helmet of the dress, in order that the diver might ascertain his position when below the water.

In 1836 Mr. Frazer made an improved escape valve and other additions to the dress.

In 1838 Mr. Thornthwaite, of Hoxton, produced a diving belt, for which he was rewarded with a silver medal by the Society of Arts, and his invention was ordered to be placed in their repository. His instrument consisted of a belt of India rubber cloth, to which was attached a small strong copper vessel ; into this, air was forced by a condensing pump, until it had a pressure of between thirty and forty atmospheres. The belt being put on in a collapsed state, did not give any buoyancy, nor impede the diver in his descent. If he desired to rise, he opened a valve, by which the condensed air escaped from the metal vessel into the belt, and by its expansion enabled him to rise to the surface.

In the ordinary apparatus and helmet great alterations have been effected from time to time by the various makers. The improvements introduced by Mr. E. Heinke and the author, some of which are shown in figures 1, 2, and 3, are based upon long experience of the defects com-

plained of in ordinary apparatus. The submarine dress, as manufactured at that period, was exhibited at the Great Exhibition in Hyde Park, in 1851, and obtained the award of a medal; since that time several additional improvements have been made, and so nearly perfect may the apparatus be now considered, that there are few persons who would hesitate to go down in the dress after once seeing it used.

Among the most prominent of the improvements, is that of the eye-frame, to which is affixed a brass slide, so contrived that in case of accident to the glass the diver can immediately close it, and thus save himself from drowning. A double valve fixed in the front of the gorget enables the diver to descend and rise at pleasure, with the whole of his gear, which weighs upwards of 200lbs; in fact it places the whole apparatus completely under his control, and protects him in case of anything happening to the air hose, as by its means a sufficient quantity of air, to support respiration for ten minutes, can be contained in the helmet and dress, thus giving time to ascend, even from a very great depth. The connecting joints are now so manufactured that they can scarcely be broken, as they will resist the most powerful pressure, in consequence of having a double safety cap affixed.

The new vulcanized band completely excludes the water from the dress, and enables it to fit more easily and with greater comfort to the wearer. The signal dial makes the wants of the diver known to those above, instantly and correctly, and, in fact, renders the apparatus nearly complete for the most difficult undertakings.

A woodcut is subjoined, showing a section and elevation of one of Heinke's helmets, as also a sectional view of the valve. Fig. 1 shows a front elevation of the helmet itself. It will be seen from this that the openings are also provided (as an extra safety-guard) with segmental plates, so that, by turning either disc round by means of the buttons which project from the circumference, the openings can be closed instantaneously. The regulating or safety-valve is seen in front of the helmet, just below the joint indicated by the letter A, which joint enables the whole top of the helmet to be taken off at pleasure. Fig. 2 shows a section through the head-piece, exhibiting the pipe at the back, through which the air is fed down the valve for safety in the event of the bursting of a feed pipe. From the orifice will be seen the tubes, extending over the upper internal surface of the helmet, for leading the stream of air over the glasses; and again below, and marked by the letter B, will be seen the safety-valve before-mentioned, which can be opened or shut at pleasure by the diver. This valve is shown in section on a larger scale in Fig. 3. It will there be seen that an ordinary valve, which is held in place upon its seat by means of a spiral spring, is covered with a cap perforated on the top, so as to allow of the escape of such air as passes, but so fitted as to turn upon the outside of the valve-box or seat at pleasure; this is provided with a long slotted hole, which runs some distance around its circumference, and the lower part of the valve-seat or box is provided with a similar slot. From this description it will be apparent that the cap can be turned, so as either to let the two holes be in one, and thus open to allow of the escape of the air, or be closed, should it be desired; by this simple contrivance the diver can regulate the egress of the air, and so, the extent of the supply,

FIG. 1.

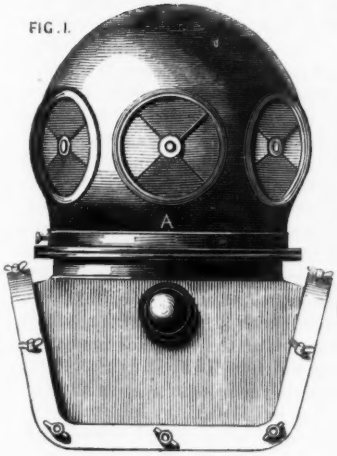


FIG. 2.

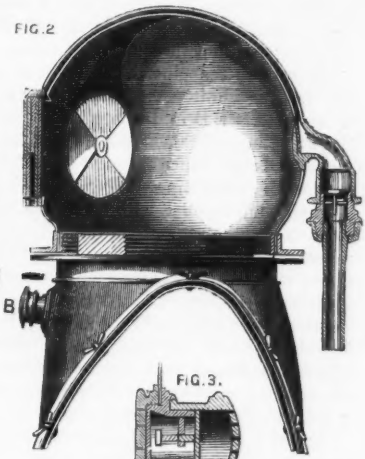


FIG. 3.

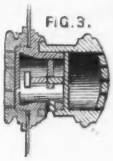
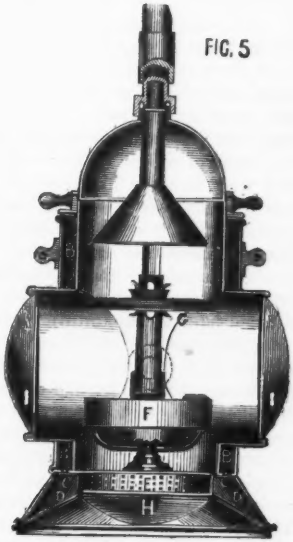


FIG. 4.

FIG. 5.



to the greatest nicety. Figs. 4 and 5 show a side elevation and longitudinal section of my lamp, which, it will be noticed, possesses the following peculiarities and advantages. The amount of air which is supplied through the pipe A, Fig. 4, can be regulated by means of the tap; the air thus admitted flows into the external ring or case, which is shown by the letters B B in the sectional elevation, Fig. 5: it then finds its way through the perforated plate C C, at the bottom of the ring, into the receptacle D D, and thence through the strainer E into the lamp itself, for the support of combustion. The burner itself is of the form commonly called Argand, and supplied with oil or gas from the ring F, which is made open, so as to allow of the light from the lamp being thrown down from the reflector G, through the lense H, so that by this means the bottom surface of the sea can be examined without removing the lamp from its upright position. The lamp is also provided with two side lenses I I; or three can be used if required. The upper cap is fitted with an internal cone, which is connected with a pipe leading to the surface of the water for the escape of the products of combustion. This lamp gives a brilliant light, and the air supplied percolating through the lower ring enables it to burn steadily, a matter of considerable importance in such cases.

In 1855 a number of interesting trials took place with my apparatus in various places. The experiments which were conducted at Portsmouth, in the month of June, in the presence of the Admiral Superintendent and Dockyard officers, gave great satisfaction; the diver remaining below, half an hour at a time, in a depth of water of 3½ fathoms. At Chatham dockyard, in October, a similar trial took place, in the presence of the Captain Superintendent and several gentlemen connected with the establishment, as well as many officers of the corps of Royal Engineers and others, who all expressed their gratification at the result of the experiment.

At Paris it was tested on the Seine, by command of the French Government, and in the presence of Prince Napoleon, a large number of military and other engineers, the Commissioner-in-Chief, the Secretary of the Exhibition, and the members of the International Jury. On that occasion five kinds of diving dresses were tried (of which three were English and two were French) in every variety of situation. The apparatus which was attended with the most succesful results, and which it was decided possessed the greatest facilities, was that exhibited by myself. The diver, without any assistance, raised himself to the surface by partly closing the valve in the breastplate of the helmet; the compressed air thus filled the waterproof dress, and brought him up. When he wished to descend he had only to turn on the air valve.

In order to test the alertness of the divers twelve small rings were thrown into the river; of these my diver picked up ten, and the other two were not found by any of the divers. Again, at the request of Prince Napoleon, he went down with a helmet, the glass of which had been accidentally broken at the Westminster Bridge works, and which, of course, admitted water; he immediately closed the safety valve as directed, and remained under water half an hour, before coming to the surface. The under-clothing was then examined, and was found to be perfectly dry. The divers representing the other makers were then requested to submit their apparatus to the same test, but they all declined. The French

exhibitor, M. Ernoux, at once and in the most handsome manner acknowledged the superiority of Messrs. Heinke's apparatus, stating that he considered it really perfect.

At the close of the Paris Industrial Exhibition, a first-class medal was awarded for the apparatus, which was transferred to the Crystal Palace at Sydenham.

Mr. PEPPER said, as far as he had examined the lamp he should say it was a very valuable and practical instrument. At the Polytechnic Institution he was most anxious to illuminate the operations of divers. The ancients had a great idea of a lamp which was to illuminate their tombs for ever; but they seemed to have lost sight of the principles which Mr. Heinke had carried out in his lamp. Suppose a lamp shut up in a subterranean place, supplied with fuel to burn for a long time, it must be extinguished by the carbonic acid gas. Now Mr. Heinke provided for that by forcing in a constant supply of fresh air. Again, the ancients had to provide a material which would burn for ever, but Mr. Heinke provided a lamp which anybody could trim and use at pleasure. He had himself tried to apply the oxy-hydrogen light for submarine purposes. It was provided with a double cylinder of glass, and answered remarkably well in his hands. It was then placed in the hands of attendants, and they soon afterwards reported to him that they had had a dreadful accident, and that the lamp was blown out. The next light he tried was the electric light of M. Du Boscy, of France. While that gentleman remained in England to superintend the operations, the lamp answered remarkably well, but the gentlemen in whose charge it was left were unable to carry them out. These two lamps were accordingly put aside. Now, if they were provided with this simple apparatus of Mr. Heinke, which was provided with common oil, and when let down into the water supplied with fresh air, he was sure it would answer remarkably well.

Captain NOLLOTH reminded Mr. Heinke of the submarine operations of Captain Dickenson, who recovered nearly a whole cargo of dollars. The ship's tanks were ingeniously converted into divingbells, and with these Captain Dickenson carried out his operations.

Mr. HEINKE said the lamp had been extensively used at Westminster bridge. The water there being thick, they could only see about eighteen inches or two feet, but it enabled the engineer to examine the granite, and to see if the divers had done their work in a proper manner. At Dovor, the water not being so thick, but of a light, milky hue, caused by the admixture of chalk, they could see nine or ten feet all around. It was of great assistance, and was used extensively. The same with the diving apparatus, which was superior to the diving bell to this extent, that a diver could lay eight large blocks of stone, each block weighing about 7 tons, in four hours, whereas with the diving bell he could only lay 5 at the most.

The CHAIRMAN asked Mr. Heinke if he had seen any of the tubes used with a glass end to them, for seeing under water.

Mr. HEINKE said he had not. He thought Mr. Bethell had a kind of funnel which he dipped in the water to a certain extent. Where the water was not very thick it would answer, but at Westminster bridge it would be impossible to use it. The engineer in charge of the works, Mr.

Harris, made a point of going down every day to see if the divers had done their work properly. His apparatus had been in use these four years and a half, and all the under-water work had been done by means of it, without a single accident.

The CHAIRMAN asked whether the machinery for the diving apparatus was not less than that required for the diving bell.

Mr. HEINKE replied it was. He recommended that every ship of war should be provided with one of his apparatus.

The CHAIRMAN asked what was the expense?

Mr. HEINKE replied, with all the improvements it would cost about £140, and that the diving apparatus would cost about £7 per week for working expenses, whilst the diving bell would cost from £18 to £22.

The CHAIRMAN moved a vote of thanks to Mr. Heinke for his communication. It was a very important one. The simplicity of the lamp must make it succeed; there was nothing complicated about it. Deane's apparatus was likely to get out of order. He saw a case at the Cape where they wanted to use it but could not.

ERRATUM.

Vol. IV. Page 105, *for* Higgins, W. F. Esq., late War Department, *read* late Colonial and War Department.

A large MODEL has lately been added to the collection in the Institution, representing, on a scale of 8 feet to an inch, the WORKS OF ATTACK AND DEFENCE at the CLOSE of a SIEGE conducted against a front of VAUBAN'S First System of Fortification.

This Model was constructed at the ROYAL ENGINEER ESTABLISHMENT at CHATHAM, under the direction of COLONEL SANDHAM, R.E., and the immediate superintendence of CAPTAIN SCHAW, R.E., by Second Corporal NEWTON and Sapper W. BENNETT, R.E.